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ABSTRACT

Up to 10 persons a year are awarded medals for high performance in the South African Mathematics Olympiad, designed to stimulate the love for mathematics and to discover and reward youthful talent and aptitude. Questionnaires were sent to this group to ascertain their achievements, as a means of evaluating the effectiveness of the Olympiad. In the 18 years studied, there were 164 medallists (154 boys and 10 girls). Data on their background, scholastic training, academic training on the tertiary level, participation in cultural activities and sports, military service, occupations, and marital status are presented and discussed. Fifty-three percent of the medallists were in a full-time occupation, most in an engineering or math-related field. The other 47 percent were studying full time. An evaluation of the Olympiad concludes that it has been successful in meeting its aims. Recommendations for future mathematics competitions are also included. (MNS)

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Report 0-181

1985

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The South African Mathematics Olympiad: A case study of the medallists from 1966 to 1983

P.G. le Roux
C.S. Engelbrecht
Johanna H. van Schalkwyk

Translated by:
Isabel M. Botha

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P.G. le Roux, B.Com., M.Ed.
C.S. Engelbrecht, B.Sc., B.A., D.Ed.
Johanna H. van Schalkwyk, B.Com., M.Ed.

Translated by:
Isabel M. Botha, B.A., H.E.D.

Institute for Educational Research
Executive Director: Dr S.W.H. Engelbrecht

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PREFACE

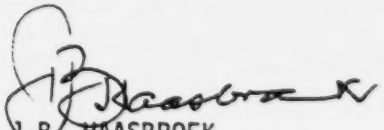
The talented mathematics pupil has inherent need for mathematical exercises that will provide him with a real challenge. This need, as well as the need to identify such pupils, was pointed out in 1965 in an HSRC report on the teaching of mathematics and followed up by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns which instituted the Mathematics Olympiad in 1966. Since then the ten (sometimes fewer) pupils who perform best in the Mathematics Olympiad each year have been awarded a Dirk van Rooy medal for their special achievement.

At the request of the Akademie vir Wetenskap en Kuns the HSRC has for 18 years (1966-1983), kept an updated list (as far as possible) of the addresses of this particular group of persons, and also obtained additional information on the medallists by means of questionnaires, mainly with a view to reporting to the annual meetings of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns from time to time on the achievements of this exceptional group of men and women. As can be expected, the information obtained was of a limited nature and this imposed certain restraints on the report.

Furthermore, in obtaining the information, there has not always been full response from all the medallists (probably largely due to changes of addresses) with the result that in almost 25% of cases certain information was not available. This must necessarily affect the overall picture to a certain extent and should be borne in mind when reading this report.

In a certain sense it was sometimes not possible to identify a particular system and order in the activities of this group of high achievers who per definition are individualists.

Sincere thanks are due to dr A.J. van Rooy (previous Vice-President of the HSRC) for his pioneering and devoted work on this project. Gratitude is also expressed to the medallists and all other persons involved in the publication of this report.



J.B. HAASBROEK
DIRECTOR
INSTITUTE FOR EDUCATIONAL RESEARCH

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OPSOMMING

Die belangrike rol wat die hoogbegaafde kind as volwassene behoort te vervul in die oplos van die hedendaagse probleme word toenemend deur politici, ekonome en opvoedkundiges besef. Volgens hulle is dit gebiedend noodsaaklik dat meer en beter meganismes vir die identifisering van hoogbegaafde leerlinge ontwikkel word sodat geleenthede en programme aan dié leerlinge gebied kan word waardeur hul spesiale talente tot almal se voordeel ontwikkel kan word. Die Suid-Afrikaanse Wiskunde-olimpiade is in 1966 deur die Suid-Afrikaanse Akademie vir Wetenskap en Kuns ingestel, juis met die doel om leerlinge met 'n besondere aanleg in wiskunde te identifiseer en om in die behoefte aan spesiale wiskunde-oefeninge te voorsien.

Die Wiskunde-olimpiade-eksamen word in twee rondes verdeel, naamlik 'n uitdunronde en 'n finale toets om die bestes onder die goeies te identifiseer. Gemiddeld het 6,7 % van die totale aantal Blanke st. 10-leerlinge jaarliks vir die eerste ronde ingeskryf terwyl dié syfer vir die ander bevolkingsgroepe heelwat minder was. Die afgelope drie jaar het die eerste ronde se inskrywings bestaan uit nagenoeg 79 % Blankes, 6 % Swartes, 2 % Kleurlinge, 11 % Asiërs en 2 % uit alle rassegroepe in Zimbabwe. Van hierdie inskrywings vir die eerste ronde het slegs 2,7 % deurgedring na die tweede ronde. Die tien (soms minder) leerlinge wat jaarliks die beste gevaar het in die tweede ronde, is elk met 'n Dirk van Rooy-medalje bekroon. In totaal was daar 164 medaljewenners van 1966 tot 1983 (154 seuns en 10 meisies).

Vraelyste is telkens aan die medaljewenners van elke jaar gestuur om sekere agtergrond- en skoolprestasie-inligting te bekom, terwyl aanvullende vraelyste van tyd tot tyd uitgestuur is om sekere naskoolse inligting te bekom. Hierdie inligting het interessante feite aan die lig gebring waarvan sommiges in hierdie kort opsomming genoem word:

. Slegs een uit elke 4 584 Blanke matrikulante is oor die agtien jaar as medaljewenner bekroon.

. Die huistaal van 73 % van die medaljewenners was Engels, 18 % Afrikaans, 1 % Engels sowel as Afrikaans en 8 % 'n ander taal. (Die inskrywings

vir die eerste ronde het min of meer dieselfde verhouding getoon.) Die kwalifikasies van die vaders en moeders van die medaljewenners was meestal bogemiddeld (67 % van die vaders het 'n universiteitsgraad besit en 7 % 'n diploma as hoogste kwalifikasie; vir die moeders het het hierdie persentasies 31 % en 26 % beloop), terwyl hul beroepe hoofsaaklik in die professionele of semi-professionele groep geval het.

. Uit inligting oor die skoolopleiding blyk dat 52 % van die medaljewenners provinsiale skole en 48 % provinsiaal ondersteunde/private skole bygewoon het. Die 164 medaljewenners was as matrikulante aan 79 verskillende skole verbonde. In die matrikulasie-eksamen het 99,3 % van die medaljewenners 'n onderskeiding in wiskunde behaal en 93,1 % in natuur- en skeikunde/natuurkunde/skeikunde.

. Van die 164 medaljewenners het 99,2 % reeds tersiêre opleiding ontvang of was tydens die opname daarmee besig. Van hierdie groep het 73 % in 'n ingenieurs- of natuurwetenskaplike studierigting gestudeer of was in daardie rigting besig.

. Tydens die opname het ook geblyk dat 53 % van die medaljewenners voltyds 'n beroep beoefen het terwyl die ander 47 % nog voltyds gestudeer het. Die meeste medaljewenners se beroepe was in 'n ingenieurs- of in een of ander syferkundige rigting.

Te oordeel aan die inligting wat deur middel van vraelyste van die medaljewenners van die Wiskunde-olimpiade ontvang is, asook op grond van spontane korrespondensie van die medaljewenners, kan met reg beweer word dat die Suid-Afrikaanse Akademie vir Wetenskap en Kuns grootliks in sy doel met die Wiskunde-olimpiade geslaag het, naamlik

(a) om 'n meganisme te skep waardeur leerlinge met 'n besondere talent in wiskunde (d.w.s. leerlinge wat tot oorspronklike denke in staat is) geïdentifiseer kan word en

(b) om die wiskundig hoogbegaafde leerling voor 'n unieke uitdaging te plaas wat sy behoefte aan so 'n spesiale wiskunde-oefening kan bevredig.

SUMMARY

The importance of the role that the gifted pupil in later life has to play in solving the problems of our day, is increasingly stressed by politicians, economists and educators. More and better mechanisms had to be developed to identify the highly gifted pupil in order to present him with an opportunity or programme to develop his special ability for the benefit of all. The South African Mathematics Olympiad was established in 1966 by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns with the aim of identifying pupils with a special talent in mathematics and of making provision for special mathematical exercises.

The Mathematics Olympiad examination consists of two rounds, the first of which is an eliminating round and the second to identify the best pupils. On average 6,7 % of the total number of White Std 10 pupils take part annually in the first round. This percentage is considerably lower for the other population groups. For the past three years the group that entered for the first round consisted of approximately 79 % White pupils, 6 % Blacks, 2 % Coloureds, 11 % Asians and 2 % of all race groups in Zimbabwe. Only 2,7 % of these entrants for the first round qualified for the second round. The ten pupils (sometimes fewer) who obtained the highest marks in the second round each year, each received a Dirk van Rooy medal. In the past 18 years (1966-1983) there have been 164 medallists in total (154 boys and 10 girls).

At the beginning of each year questionnaires are sent to the medallists of the previous year to obtain information regarding their home/backgrounds and school activities. Additional questionnaires are sent to medallists from time to time to obtain postschool information. The information obtained so far reveals *inter alia* the following interesting facts:

. Only one out of every 4 584 White matriculants qualified for a medal.

. The home language of 73 % was English, 18 % Afrikaans, 1 % English as well as Afrikaans and 8 % some other language. (The entries for the first round were more or less in the same ratio.) The qualifications of the fathers and mothers of the medallists were mostly above average

(67 % of the fathers had obtained a degree and 7 % a diploma; 31 % of the mothers had obtained a degree and 26 % a diploma) and they were mainly professional or semiprofessional people.

. The information on their school education showed that 52 % of the medallists were educated at provincial schools and 48 % were educated at provincially aided or private schools. The 164 medallists matriculated at 79 different schools. In the matriculation examination 99,3 % of the medallists obtained a distinction in mathematics and 93,1 % in physical science.

. Of the 164 medallists, 99,2 % received or were still receiving tertiary education. It was also determined that of this group 73 % studied (or were still studying) engineering or the natural sciences.

. Fifty-three percent of the medallists were in a full-time occupation. The other 47 % were studying full time. Most medallists were employed in an engineering or numerical field.

Information obtained through questionnaires as well as letters from the medallists, showed that the Suid-Afrikaanse Akademie vir Wetenskap en Kuns had achieved the two main aims of the Mathematics Olympiad, namely

(a) to develop a mechanism by which pupils with a special talent in mathematics can be identified, and

(b) to supply the mathematical highly gifted pupil with a unique challenge that will satisfy his or her need for special exercises in mathematics.

CHAPTER 1

THE ORIGIN AND ORGANIZATION OF THE MATHEMATICS OLYMPIAD

1.1 INTRODUCTION

This report is based on information obtained following a request made by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns to the then National Bureau of Educational and Social Research (the predecessor of the present HSRC) to keep an up-to-date list of the addresses of all the medallists in the annual Mathematics Olympiad. The aim of this request was to keep in touch with these winners and to remain informed of their later study and occupational careers. The main driving force behind the updating of the address list was Dr A.J. van Rooy, previous Vice-President of the HSRC, who co-ordinated this task until his retirement in 1982. Dr Van Rooy also reported periodically on the progress of the medallists in life at the annual meetings of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns.

When Dr Van Rooy retired, the possible continuation of the project was discussed. Three possibilities were considered:

- The project could be discontinued;
- Dr Van Rooy could continue the project in his private capacity, or
- the HSRC could take over all arrangements in connection with the project from Dr Van Rooy and continue with the project.

Following the discussion that took place during the annual meeting of the Advisory Council of the Institute for Educational Research in 1983, the following decisions were made:

- In view of the renewed interest in the teaching of the gifted child, and to link up with the research that is being conducted by the HSRC on high-level manpower utilization, the HSRC should proceed with the project (i.e. the third possibility mentioned).

- Simultaneously a decision was taken to concentrate on the home and school background of the medallists, as well as on their

tertiary study records and occupational careers on a wider basis than hitherto.

. Thirdly it was decided to evaluate carefully the meaningfulness, validity and value of the Mathematics Olympiad.

To place the report in context, it may be useful to concentrate first on the origin, aims and organization of the Mathematics Olympiad, and afterwards to examine the way in which the investigation was conducted.

1.2 THE ORIGIN OF THE MATHEMATICS OLYMPIAD

The origin of the Mathematics Olympiad in South Africa can be traced to a need identified by the Mathematics Society of South Africa, during the late 1950s, namely the urgency of rectifying certain deficiencies in the teaching of mathematics at school. On 4 September 1959 the Secretary of the South African Mathematics Society at the time, Dr J. van der Mark, requested the then National Bureau for Educational and Social Research to conduct an in depth research on the position and quality of the teaching of mathematics at high schools in South Africa, with a view to exposing specific deficiencies (HSRC, 1971a : 1). This led to an investigation conducted by Dr A.J. Van Rooy (former Deputy President of the National Bureau for Educational and Social Research), and in his report that appeared in 1965 he recommended *inter alia* that countrywide competitions be organized among schools and individuals. In this way an interest in mathematics would be encouraged.

At the annual meeting of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns in Potchefstroom during July 1965, Dr Van Rooy delivered an address on mathematics teaching in South Africa, based on the findings of his investigation. On this occasion he again advocated the organization of countrywide mathematics competitions. On 19 November 1965 the Council of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns did in fact decide to present an annual countrywide Mathematic Olympiad for high school pupils in the Republic of South Africa. The aim was to make a practical contribution to already existing efforts to

identify the youthful talent (and more specifically, the mathematical aptitude) of gifted pupils timeously, and to arouse their interest in a mathematical career (HSRC, 1971a : 1).

This step taken by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns was in accord with current practice in many overseas countries where mathematics olympiads had already become annual institutions. The idea of arranging a mathematics olympiad originated in Hungary, where special countrywide exercises or competitions in mathematics and physical science were specifically arranged in 1894 to celebrate the appointment of the chairman of the Hungarian Mathematic Society, Baron Eötvös, as the Minister of Education (HSRC, 1971b : 1). Since then a number of countries have followed the Hungarian example. In fact, the interest was so great that international mathematics olympiads have been held since 1959 (*Science Education Newsletter*, January, 1981 : Item 26).

1.3 THE ORGANIZATION OF THE SOUTH AFRICAN MATHEMATICS OLYMPIAD

Since its inception, the South African Mathematics Olympiad has been controlled by a committee of nine members: five are appointed by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns, while the other four are appointed by the Committee of Heads of Education in the RSA. In order to help combat the high cost of the Mathematics Olympiad, the sponsorship of a large insurance company was obtained. This sponsorship assists the Suid-Afrikaanse Akademie vir Wetenskap en Kuns financially every year.

The Mathematics Olympiad consists of two parts: a preliminary contest followed by a final test to identify the best candidates among the good ones. The first round selects potential winners and the second round then determines the ten medallists. An olympiad of this kind eventually ends therefore with a small group of outstanding pupils. The examination is far beyond the abilities of the average and weak pupils (HSRC, 1971a : 2).

Various persons are approached annually to submit possible questions for the two Mathematics Olympiads to the controlling committee of nine members, who are then responsible for drawing up the two papers. It is important to note that considerable time for reflection is allowed in the papers because the questions are not at all directed at reproduction. In fact, were a candidate immediately able to answer all the questions, only an hour would be needed to complete the three-hour paper.

Those pupils who annually perform best in the second (and final) round (normally there are ten, though sometimes fewer if the performance is not up to the set standard), each receive a Dirk van Rooy medal from the Suid-Afrikaanse Akademie vir Wetenskap en Kuns. The medals, one gold for the overall winner and nine silver for the runners-up, have been named after the late Prof. Dirk van Rooy (father of the already mentioned Dr A.J. van Rooy) who for many years was Head of the Mathematics Department of the Potchefstroom University for Christian Higher Education and generally recognized as a great mathematician (HSRC, 1971a : 2).

1.4 THE AIM AND SIGNIFICANCE OF THE MATHEMATICS OLYMPIAD

The most important aim at the inception of the Mathematics Olympiad was at the time defined as follows:

"Through its Mathematics Olympiad the Suid-Afrikaanse Akademie vir Wetenskap en Kuns aims at stimulating the love for Mathematics and discovering and rewarding youthful talent and aptitude in time" (HSRC, 1971a : 1)(translation). Malan (1969 : 117) underlines this and adds that the Mathematics Olympiad attempts to discover and reward aptitude, originality and competence in mathematics at school level in order to promote the study of the subject in this way. For this very reason the papers,as in all the overseas mathematics olympiads,are aimed at the exceptionally good candidates. One may draw a parallel with sports olympiads where only the best participants in each kind of sport are sought and in which only the particularly good athletes participate. Were this not the case and anyone was free to enter the Mathematics Olympiad "just for the exercise", such an olympiad would not serve its

purpose. The average and below-average pupils would soon lose heart, and that would probably do more harm than good. The exercises given in the mathematics class at school usually present adequate challenge for these pupils.

It is, however, important to remember that although talent is a crucial prerequisite for achievement in the Mathematics Olympiad, this talent has nevertheless to be developed by tuition and exercise. From the 1970 report on the Mathematics Olympiad (Suid-Afrikaanse Akademie vir Wetenskap en Kuns, 1971 : 3) it is clear that the effect of the particular school (in other words the tuition effect) still plays an important role in the first round of the olympiad. However, in the final round the abilities of the candidate are far more crucial. According to Malan (1969 : 136) an aptitude and a skill for mathematics involve a sharp insight into the knowledge on which the question is based, originality in the method followed to solve the problem and the ability to deduce the answer in a systematic (reasoned) manner. In this way the questions that are asked in the Mathematics Olympiad indeed succeed in discovering real mathematical talent.

The main difference between the Mathematics Olympiad and the traditional examination is that the former expects original thinking from the pupil, whereas in the latter the pupil's achievement is chiefly determined by his knowledge of the subject and the application of such knowledge to solve fairly standard problems. A Standard 9 pupil will only with great effort manage to pass the traditional matriculation examination in mathematics on the higher level, while two Standard 8 pupils have already succeeded in beating many Standard 10 pupils in the Mathematics Olympiad and have won medals. Pupils who excel at school examinations often drop out in advanced study, whereas Mathematics Olympiad winners often gradually gain more momentum (Malan, 1971 : 7).

The additional aims of the Mathematics Olympiad were stated as follows in an HSRC publication (1971b : 10) (translation):

"(a) To raise the level of the mathematics teaching that pupils receive;

(b) to present a challenge to highly gifted pupils as an additional motivation;

(c) to draw the attention of the pupils to the possibility of following a career as a mathematician;

(d) to realize the mathematical potential of the gifted child;

(e) to force the pupils to think intensively, to think a lot and to write little, and

(f) to encourage pupils to enrich their knowledge through work outside the classroom situation and to broaden and deepen their insight into the basic mathematical concepts."

1.5 PERSPECTIVE

When reflecting on the Mathematics Olympiad, the question arises whether the whole enterprise has indeed been meaningful. To find an answer to this, consideration must be given to the question why mathematicians are interested in problem solving. Man by nature tends to devote himself to the direction or field in which he finds satisfaction and where he can practise and develop fully his abilities or talents. For example, an artist wants to capture his visual experience on canvas, a sportsman wants to exercise his body to use it successfully and with enjoyment in some or other kind of sport, and a writer or singer wants to give to others his interpretation of reality. In the same way the mathematician finds meaningfulness and personal fulfilment through his solving of problems. It is true that man can have divergent motives for applying himself in a certain direction, but it is important to take the absolute motive as the norm. The believer regards it as a God-given talent to be practised and developed to the best of his ability in the service of his Creator and his fellow-man.

To help the pupil with an aptitude for mathematics to develop this talent, various opportunities for exercise can be created, ranging from an ordinary mathematics period at school to a Mathematics Olympiad. It should, however, be made clear that in the solving of any mathematics problem or in answering any mathematics paper the prime motive should not be competition with others, but the enjoyment that the pupil obtains from such exercise. The prime aim should thus be "the joy of achievement". Wherever competition is introduced in the Mathematics Olympiad,

it should be primarily aimed at forcing the participant to compete with himself, and it should be clear that winning any prize that may be at stake is a bonus and not the aim in itself.

1.6 THE AIM OF THE INVESTIGATION

The primary aim of this investigation was to form a picture of the medallists as a group of mathematically gifted persons, based on the information that has been gathered since the inception of the Mathematics Olympiad. Although the emphasis in the compilation of this picture is on their home background, school achievements, tertiary study and career, this image also needs to be supplemented with information about their interests, leisure activities, hobbies, participation in cultural and sports activities and their marital status.

A secondary aim of this investigation was to try to establish from the picture obtained the extent to which the Suid-Afrikaanse Akademie vir Wetenskap en Kuns has so far achieved its aim with the Mathematics Olympiad. Has it indeed succeeded in realizing the objectives stipulated in Paragraph 1.4? To mention a few:

- Has it raised the level of the mathematics teaching that pupils receive?
- Has it served to draw the attention of the highly gifted pupils to the possibility of following a career as a mathematician?
- Are the pupils forced to "...think intensively, think a lot and write little"?
- Are the pupils encouraged to enrich their knowledge through work outside the classroom situation and to broaden and deepen their insight into the basic mathematical concepts?

The question arises whether it is at all possible to arrive at a conclusion (in other words, to provide these answers) with the information that has been gathered since 1966.

1.7 THE AVAILABLE INFORMATION

When reading the report, certain factors should be borne in mind:

1) As previously stated the information collected originally on the medallists was intended solely for the compilation of an address list and with a view to reporting to the annual meetings of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns from time to time on the achievements of this exceptional group of men and women. As can be expected, the limited nature of the information imposed certain restraints on the report.

2) Furthermore, in obtaining the information, there has not always been full response from all the medallists (probably largely due to changes of address) with the result that in almost 25 % of cases certain information was not available. This must necessarily to a certain extent affect the overall picture presented by the report.

The information that is available was compiled mainly as follows:

- At the beginning of each year a questionnaire was mailed to the ten medallists of the previous year, and by means of this document basic information was obtained on their home background, school activities and achievements (Std 10 results in particular), future plans and postal address at that stage.

- In addition questionnaires were periodically sent to the last known address of each of the medallists, in order to obtain postschool information on each one's field of study, achievements in study, further study, career, marital status and leisure activities.

3) In a certain sense it was sometimes not possible to identify a particular system and order in the activities of this group of high achievers who per definition are individuallists.

CHAPTER 2

DATA CONCERNING THE MEDALLISTS FROM 1966 TO 1983

2.1 GENERAL

2.1.1 Entry

Judging by the number of entries for the first round (see Table 2.1), the Mathematics Olympiad was a success from the very start. The 5 800 pupils who for example entered in 1968 for the first round, represented 4,8 % (5 800 out of 120 509) of all White pupils in Standards 8, 9 and 10 in the RSA; or differently put, 19,4 % (5 800 of 29 834) of all White Std 10 pupils in the RSA in 1968 (Department of Statistics: Annual Report 1968 : 23). The sharp drop in the number of entries for 1969, evident in Table 2.1, can be ascribed to a request by the organizers for schools to enter only their most promising pupils, a request in keeping with the aim of the enterprise, and made necessary by the high dropout rate in the first round and the growing interest in the competition.

The number of schools that have to date entered pupils in the Mathematics Olympiad varies considerably - in the beginning (in other words in 1966) 443 schools were involved. The figure gradually decreased to 330 in 1975 and then again increased to 494 in 1983. According to the annual reports of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns pupils from 395 White secondary schools took part in the Olympiad in 1981. This number represents 49,3 % of the 802 White secondary schools that according to the HSRC Register of Schools (computer information) were in the RSA at that time. In 1980 this figure was 75 % in the case of Australia. This is a good indication that the participation by schools in the RSA can still improve considerably.

Another fact that appears from Table 2.1 is that a very small percentage of pupils manage to make it to the second round. This can be attributed chiefly to the high standard that pupils are expected to maintain in the papers.

NUMBER OF PARTICIPANTS AND SCHOOLS INVOLVED IN THE FIRST AND SECOND ROUNDS OF THE MATHEMATICS OLYMPIAD: 1966 TO 1983

Year	First round		Second round		Second round expressed as a percentage of first round	
	Pupils	Schools	Pupils	Schools	Pupils	Schools
1966	5 234	443	72	51	1,38	11,5
1967	5 544	*	119	65	2,15	*
1968	5 800	420	120	61	2,07	14,5
1969	2 840	361	119	*	4,19	*
1970	2 626	392	72	47	2,74	12,0
1971	3 229	399	155	81	4,80	20,3
1972	3 068	395	107	61	3,49	15,4
1973	2 639	390	92	54	3,49	13,9
1974	2 600	369	70	49	2,69	13,3
1975	2 318	330	57	39	2,46	11,8
1976	2 845	357	114	70	4,00	19,6
1977	3 575	391	92	57	2,57	14,6
1978	3 429	396	99	64	2,89	16,2
1979	3 533	410	103	69	2,92	16,8
1980	4 441	436	115	65	2,59	14,9
1981	5 327	505	85	52	1,60	10,3
1982	5 185	540	116	79	2,24	14,6
1983	3 992	494	107	61	2.68	12,3

Source: Annual reports: Suid-Afrikaanse Akademie vir Wetenskap en Kuns
* Figures not available

TABLE 2.2

ENTRIES RECEIVED FROM THE DIFFERENT POPULATION GROUPS FOR THE FIRST ROUND OF THE MATHEMATICS OLYMPIAD: 1981 TO 1983

Year	Whites		Blacks		Coloureds		Indians		Zimbabwe all groups		Total
	Number	%	Number	%	Number	%	Number	%	Number	%	
1981	4 049	76,0	350	6,6	127	2,4	579	10,9	222	4,2	5 327
1982	4 179	80,6	219	4,2	106	2,0	595	11,5	86	1,7	5 185
1983	3 262	81,7	219	5,5	44	1,1	467	11,7	-	-	3 992

Source: Annual reports: Suid-Afrikaanse Akademie vir Wetenskap en Kuns

Since 1971 pupils from all the population groups have been allowed to take part in the Mathematics Olympiad - including pupils in the independent as well as self-governing national states. Table 2.2 indicates that the number of Blacks and Coloureds who have participated has until recently been relatively small.

2.1.2 Number of medallists

Since the inception of the Mathematics Olympiad in 1966 until the Olympiad in 1983 there have been 164 medallists altogether. Eight of them won a medal twice, while two others repeated this accomplishment three times: a boy in the Cape managed to win a medal in 1967, again in 1968, and in 1969, while a Transvaal girl followed suit in 1967, 1977 and 1978.

2.1.3 Medallists already deceased

At this stage three of the medallists are no longer alive - all of them died as the result of accidents.

2.1.4 Sex of the medallists

It seems from Table 2.3 that many more boys (154, therefore 93,9 %) than girls (10, therefore 6,1 %) have so far been awarded medals.

TABLE 2.3
SEX OF MEDALLISTS

Sex	Number	%
Male	154	93,9
Female	10	6,1
TOTAL	164	100

2.2 BACKGROUND OF THE MEDALLISTS

2.2.1 Home language

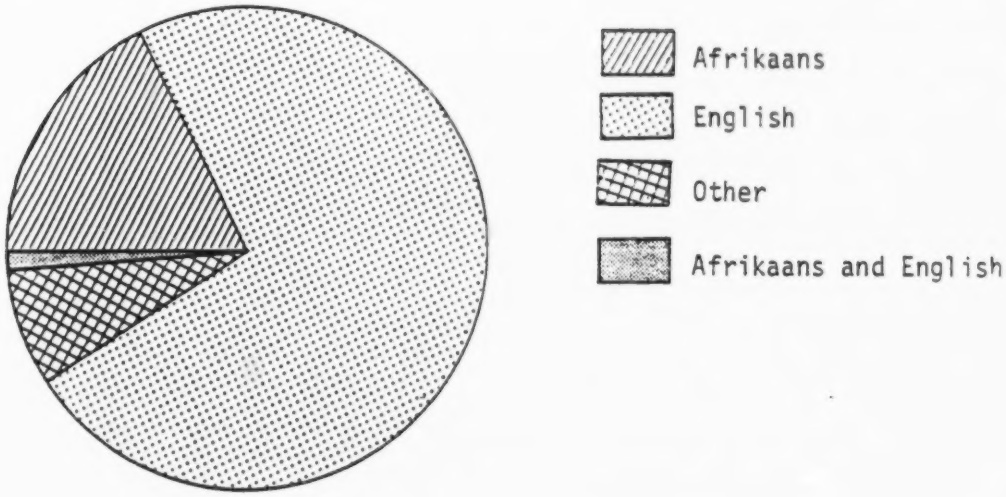
As can be seen from Table 2.4 and Figure 2.1, by far the largest group of the 164 medallists indicated that English was their home language - among them there were Indians, Coloureds and immigrants. The group "Other" includes pupils speaking German, Zulu, Chinese and Japanese.

TABLE 2.4
HOME LANGUAGE OF THE MEDALLISTS

Language	Number	%
Afrikaans	29	17,7
English	120	73,2
Afrikaans and English	2	1,2
Other	13	7,9
TOTAL	164	100

FIGURE 2.1

HOME LANGUAGE OF THE MEDALLISTS



For the sake of interest Table 2.5 can also be considered. From this it is clear that in the first round of the Mathematics Olympiad considerably more English-speaking than Afrikaans-speaking pupils are involved. The latest available official information on the ratio between Afrikaans-speaking and English-speaking pupils in the RSA appeared in the 1979 annual report of the Central Statistical Services. It stated that the ratio for Std 10 pupils was 3:2, and it can be assumed that this has remained approximately the same during the period 1966 to 1983. In view of these figures Afrikaans-speaking pupils and pupils at Afrikaans-medium schools should be encouraged to take part more regularly in Mathematics Olympiads.

TABLE 2.5

ENTRIES RECEIVED FOR THE FIRST ROUND OF THE MATHEMATICS OLYMPIAD ACCORDING TO HOME LANGUAGE: 1981 TO 1983

Year	Afrikaans		English		Afrikaans/ English		Total	
	Number	%	Number	%	Number	%	Number	%
1981	1 467	27,5	3 439	64,6	421	7,9	5 327	100
1982	1 338	25,8	3 444	66,4	403	7,8	5 185	100
1983	924	23,1	2 741	68,7	327	8,2	3 992	100

2.2.2 Qualifications and occupations of fathers

The information supplied in this paragraph is based on the questionnaires returned by 123 medallists and summarized in Table 2.6. It seems that the fathers of the majority of the 123 medallists concerned practised high-level occupations. Seventy-three (59,4 %) were in professional or semiprofessional occupations, 22 (17,9 %) practised administrative occupations, while the rest (22,7 %) were engaged in a variety of clerical, skilled artisan, transport and agricultural occupations.

The occupation most common among the fathers of these medallists was, according to Table 2.6, that of engineer - 23 (18,7 %) of them worked as engineers. The second most common occupation among the 123 responding families was that of company director (14 or 11,4 %). The third best represented occupation was that of professor (10 or 8,1 %) in different fields of study: natural sciences (4), arts (1), engineering (1), medical (1), commerce (1), theology (1) and education (1).

Table 2.6 also reveals that the fathers of these medallists obtained 43 Bachelor's degrees, 2 Honours degrees, 21 Master's degrees and 16 Doctor's degrees as their highest educational qualification.

Tables 2.7 and 2.8 respectively contain groupings of the occupations and the qualifications of the fathers in categories in order to obtain a better perspective of the situation. According to Table 2.7, 26 (21,1 %) of the 123 medallists' fathers were involved in architectural, engineering and other related professions; 24 (19,5 %) were educationists and 22 (17,9 %) were management scientists. The remaining occupational groups were less well represented.

When considering the qualifications listed in Table 2.8, it appears that 26 % (32 out of 123) of the medallists' fathers had as their highest qualifications some or other pre-tertiary school certificate, 7,3 % obtained some or other diploma and 66,7 % (82 out of 123) obtained a university degree. A degree in engineering was the qualification that was most common in the latter group - 26 out of 82, in other words 31,7 %.

TABLE 2.6

OCCUPATIONS AND QUALIFICATIONS OF THE FATHERS OF MEDALLISTS

Occupations of fathers	Qualifications of fathers																	
	B.A.	B.A. (Hons)	M.A.	Ph.D.	B.Sc.	M.Sc.	D.Sc.	B.Eng.	B.Eng. (Hons)	D.Eng.	M.B. Ch.B.	M.Med.	M.D.	M.Sc. Med.	B.Pharm.	B.V. Sc.	LL.B.	B.Com.	M.Com. and F.F.A.
No information																			
Professional or semi-professional workers:																			
Actuary																			2
Chemist															1				
Librarian			1																
Quantity surveyor					1														
Diplomat	1																		
Lecturer						1			1					1					
Physicist							1												
Physician	1										3	1	1						
Engineer:																			
Industrial								1											
Chemical								1											
Electrical								6											
Mechanical								1											
Metallurgical								1											
Civil								5		2									
Unspecified							1	5											
Journalist					1														
Cost accountant																			
Surveyor																			
Teacher	2		1		2									1					
Minister/Theologian		1																1	
Professor				1			4			1			1						1
Attorney/Advocate																	2		
Draughtsman																			
Veterinary surgeon																1			
Assessor					1														
Administrative workers:																			
Marketing manager																			
Planning officer			1																
Management consultant																			
Company director					1	2		1											1
Production manager					1			1										1	
Clerical workers:																			
Bookkeeper																			
Clerk																			
Computer operator																			
Salesworkers:																			
Insurance agent																			
Bookmaker																		1	
Salesman																			
Shopkeeper																			
Skilled artisans:																			
Printer																			
Repair service worker																			
Instructor																			
Fitter and turner																			
Technician																			
Transport workers																			
Farmer																			
TOTAL	3	1	3	1	7	3	6	22	1	3	3	1	2	2	1	1	2	3	4
Percentage	2,4	0.8	2,4	0.8	5,7	2,4	4,9	17,9	0.8	2,4	2,4	0.8	1.6	1.6	0.8	0.8	1.6	2,4	3,3

(continued)

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TABLE 2.6 (Continued)

Occupations of fathers	Qualifications of fathers																		
	B. Com.	M.B.A. and C.A.	B.Th.	D.Th.	M.Ec.	D.Ec.	Dipl. Mechanical	Dipl. Agric.	Dipl. Bookkeeping	Dipl. C.I.S	Dipl. Theology	Dipl. Draughtsman	Dipl. Surveyor	Dipl. Fitter & Turner	Cert. Std 10	Cert. Std 8	Cert. Std 6	Cert. lower than Std 6	Total	%
No information																			41	
Professional or semi-professional workers:																			73	59.4
Actuary																			2	1.6
Chemist																			1	0.8
Librarian																			1	0.8
Quantity surveyor																			1	0.8
Diplomat																			1	0.8
Lecturer				1															4	3.3
Physicist																			1	0.8
Physician																			5	4.1
Engineer:																				
Industrial																			1	0.8
Chemical									1										1	0.8
Electrical																			6	4.9
Mechanical																			1	0.8
Metallurgical																			1	0.8
Civil																			7	5.7
Unspecified																			6	4.9
Journalist																			1	0.8
Cost accountant		2																	2	1.6
Surveyor													1						1	0.8
Teacher						1									1				8	6.5
Minister/Theologian			3								1								6	4.9
Professor				1	1														10	8.1
Attorney/Advocate																			2	1.6
Draughtsman												1							1	0.8
Veterinary surgeon																			1	0.8
Assessor															1				2	1.6
Administrative workers:																			22	17.9
Marketing manager															1				1	0.8
Planning officer																			1	0.8
Management consultant	1	1																	2	1.6
Company director		2								1					4	1		1	14	11.4
Production manager															1				4	3.3
Clerical workers:																			5	4.1
Bookkeeper									1						1				2	1.6
Clerk															2				2	1.6
Computer operator															1				1	0.8
Salesworkers:																			9	7.3
Insurance agent															1				1	0.8
Bookmaker																1			1	0.8
Salesman															2				2	1.6
Shopkeeper															2		3		5	4.1
Skilled artisans:																			8	6.5
Printer																1			1	0.8
Repair service worker							1								1				2	1.6
Instructor															1	1			2	1.6
Fitter and turner														1					1	0.8
Technician															2				2	1.6
Transport workers																	1		1	0.8
Farmer								2							3				5	4.1
TOTAL	1	5	3	2	1	1	1	2	1	1	1	1	1	1	24	3	4	1	123	
Percentage	0.8	4.1	2.4	1.6	0.8	0.8	0.8	1.6	0.8	0.8	0.8	0.8	0.8	0.8	19.5	2.4	3.3	0.8		

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TABLE 2.7

OCCUPATIONS OF THE FATHERS OF MEDALLISTS

Occupational group	Number	Percentage
No information on occupations was received	41	
Trade occupations	6	4,9
Architectural, engineering and related occupations	26	21,1
Management science occupations	22	17,9
Agricultural occupations	5	4,1
Religious occupations	6	4,9
Commercial occupations	10	8,1
Clerical occupations	2	1,6
Communication occupations	3	2,4
Medical occupations	7	5,7
Natural sciences occupations	1	0,8
Educational occupations	24	19,5
Legal occupations	2	1,6
Social sciences occupations	1	0,8
Arithmetical occupations	7	5,7
Transport occupations	1	0,8
TOTAL	123	99,9

TABLE 2.8

QUALIFICATIONS OF THE FATHERS OF MEDALLISTS

Highest qualifications		Number	%
No information on qualifications was received		41	
(1) School certificates (Std 6-10)		32	26,0
(2) Diplomas (see Table 2.4)		9	7,3
(3) Degrees:	Commerce (B.Com. - D.Com., M.B.A., C.A.)	13	10,6
	Engineering (B.Eng. - D. Eng.)	26	21,1
	Arts (B.A. - D.Litt./Ph.D.)	8	6,5
	Medical (M.B. Ch.B. - M.D., M.Sc.,(Med.)		
	B.Pharm. and B.V.Sc.)	10	8,1
	Natural sciences (B.Sc. - D.Sc.)	16	13,0
	Education (M.Ed. - D. Ed.)	2	1,6
	Law (LL.B.)	2	1,6
	Theology	5	4,1
TOTAL		123	99,9

2.2.3 Qualifications and occupations of the mothers of medallists

As in Paragraph 2.2.2, the information in this paragraph is based on the questionnaires returned by 123 of the 164 medallists and the data are summarized in Table 2.9. It appears that 56 (45,5 %) of the mothers at the time practised either a professional or semiprofessional occupation, 35 (28,5 %) were housewives, 24 (19,5 %) worked in clerical occupations and the remaining 8 (6,5 %) mothers practised either an administrative, a sales or an agricultural occupation.

The 35 mothers who were housewives at the time of the postal survey(s) (this was the most common occupation), had qualifications that ranged from a Std 6 school certificate to an M.A. degree. The second biggest group was constituted by 27 teachers who had the next highest qualifications: B.A. degree (7), B.A. Hons. degree (1), B.Sc. degree (3), Diploma in Domestic Science (1), teacher's diploma (14) and one mother who had a Std 10 certificate. The other occupational groups were considerably less well represented.

Table 2.9 also indicates that as far as highest qualifications are concerned, 26 mothers (21,1 %) obtained a Bachelor's degree, (16,6 %) an Honnours degree and 4 (3,3 %) a Master's degree.

The arranged information that is contained in Tables 2.10 and 2.11 highlights the matter from a somewhat different angle. When the qualifications are considered in Table 2.10, it is clear that 42,3 % (52 out of 123) of the mothers had as their highest qualification some or other pre-tertiary school certificate, 26,8 % (33 out of 123) obtained some or other diploma, and 30,8 % (38 out of 123) obtained a university degree. The most popular field of study was the arts and literature. According to Table 2.11 the educational/teaching occupation (32 out of 123) was, besides that of housewife (35 out of 123), the most popular occupational group among the mothers of the medallists.

TABLE 2.9

OCCUPATIONS AND QUALIFICATIONS OF THE MOTHERS OF MEDALLISTS

Occupation of mother	Qualifications of mother															
	B.A.	B.A. (Hons.)	M.A.	B.Sc.	B.Sc. (Hons.)	M.Sc.	B.Eng.	B.Sc. Med.	B.Sc. Med. (Hons.)	B.Com.	M.Com.	Dipl. Nursing	Dipl. Radio-graphy	Dipl. Domestic Science	Dipl. Physio-therapy	Dipl. Secre-tarial
No information																
Professional or semiprofessional workers:																
Occupational therapist															1	
Librarian	2															
Dietician					1											
Lecturer		2				1			2							
Physiotherapist								1							1	
Engineer: Electrical							1									
Civil							1									
Social worker	3	1														
Researcher			1	1	1											
Teacher	7	1		3										1		
Radiographer													2			
Systems analyst											1					
Nurse												5				
Administrative workers:																
Company director	1															
Production manager	1															
Clerical workers: Bookkeeper										1						
Clerk																
Quality controller																
Secretary/typist																4
Salesworkers: Saleswoman																
Shopowner																
Farmer																1
Housewife	2		1	2								1				
TOTAL	16	4	2	6	2	1	2	1	2	1	1	6	2	1	2	5
Percentage	13,0	3,3	1,6	4,9	1,6	0,8	1,6	0,8	1,6	0,8	0,8	4,9	1,6	0,8	1,6	4,1

(continued)

TABLE 2.9 (continued)

Occupation of mother	Qualifications of mother							
	Dipl. Design	Dipl. Teaching	Dipl. Library	Cert. Std 10	Cert. Std 8	Cert. Std 6 and lower	Total	%
No information							41	
Professional or semiprofessional workers:							56	45.5
Occupational therapist							1	0.8
Librarian			1				3	2.4
Dietician							1	0.8
Lecturer							5	4.1
Physiotherapist							2	1.6
Engineer: Electrical							1	0.8
Civil							1	0.8
Social worker							4	3.3
Researcher							3	2.4
Teacher		14		1			27	22.0
Radiographer							2	1.6
Systems analyst							1	0.8
Nurse							5	4.1
Administrative workers:							4	3.3
Company director				1			2	1.6
Production manager				1			2	1.6
Clerical workers:							24	19.5
Bookkeeper				4		1	6	4.9
Clerk				2	1		3	2.4
Quality controller				1			1	0.8
Secretary/typist	1			8	1		14	11.4
Salesworkers:							3	2.4
Saleswoman				2			2	1.6
Shopowner				1			1	0.8
Farmer							1	0.8
Housewife	1			26	2		35	28.5
TOTAL	2	14	1	47	4	1	123	99.9
Percentage	1.6	11.4	0.8	38.2	3.3	0.8	99.9	

TABLE 2.10

QUALIFICATIONS OF THE MOTHERS OF MEDALLISTS

Qualification group		Number	%
No information on qualifications was received		41	
(1) School certificates (Std 6-10)		52	42,3
(2) Diplomas:	Medical	10	8,1
	Design	2	1,6
	Educational	16	13,0
	Secretarial	5	4,1
(3) Degrees:	Commerce (B.Com., M.Com.)	2	1,6
	Engineering (B.Eng./B.Sc. (Eng.))	2	1,6
	Arts (B.A. - M.A.)	22	17,9
	Medical (B.Sc. (Med.))	3	2,4
	Natural sciences (B.Sc. - M.Sc.)	9	7,3
TOTAL		123	99,9

TABLE 2.11

OCCUPATIONS OF THE MOTHERS OF MEDALLISTS

Occupational group	Number	%
No information on occupations was received	41	
Management science occupations	4	3,3
Agricultural occupations	1	0,8
Housewife	35	28,5
Engineering occupations	2	1,6
Trade occupations	10	8,1
Clerical occupations	3	2,4
Communication occupations	3	2,4
Medical occupations	11	8,9
Research	3	2,4
Educational occupations	32	26,0
Secretarial occupations	14	11,4
Social sciences occupations	4	3,3
Arithmetical occupations	1	0,8
TOTAL	123	99,9

2.2.4 Hobbies

In this section the information that the medallists provided under the question "Hobbies practised" is classified under hobbies that they practised while still at school, and hobbies they pursued after leaving school or were still pursuing at the time of the survey. A further distinction is drawn between so-called passive hobbies and active hobbies. The first category includes those hobbies that do not require physical exertion, the latter category those that do.

Some of the activities that the medallists indicated as hobbies would be better defined by the term "leisure activities". For the purpose of this investigation, however, these two concepts were treated as identical.

The information with regard to the hobbies practised while the medallists were still at school is considered first. Such information was received from 131 winners and is contained in Tables 2.12 and 2.13. A hundred and nine of them (83,2 %) indicated that they practised some or other kind of hobby (see Table 2.12). The list includes 54 different kinds of such activities (see Table 2.13). There were, on the other hand, 22 who did not have a hobby. According to Table 2.12, 24 of the 131 medallists (in other words 16,8 %) practised only one hobby, 40 (30,5 %) two hobbies and 45 (34,4 %) three hobbies.

Secondly the information concerning the hobbies medallists pursued after they had left school (as adults) received from 105 of them, is taken into consideration. According to Table 2.12,71 of the 105 medallists practised one or more of the 42 (see Table 2.13) different kinds of hobbies at the time of the postal survey(s), while 34 (32,4 %) had no hobby. Of the 71 there were 32 (30,5 %) who practised only one hobby; 19 (18,1 %) practised two hobbies and 20 (19,0 %) practised three hobbies.

TABLE 2.12
NUMBER OF MEDALLISTS WHO PRACTISED A HOBBY

Number of hobbies	At school		As adults	
	Number	%	Number	%
No information	33		59	
No hobbies	22	16,8	34	32,4
One hobby	24	18,3	32	30,5
Two hobbies	40	30,5	19	18,1
Three hobbies	45	34,4	20	19,0
Subtotal: A hobby	109	83,2	71	67,6
TOTAL	131	100	105	100

Table 2.13 also reveals that "reading" was the most popular hobby at school (29,8 % of the medallists) and after leaving school (18,1 % of the medallists). "Computer work" was the second most popular activity at school, but took fourth place on the popularity list with the postschool group. As far as the hobbies of the medallists as adults were concerned, "listening to music" was second on the list. "Passive hobbies" were clearly much more popular than "active hobbies". At school this ratio was 189 : 47 (or 80,1 % : 19,9 %), and as adults it was 101 : 29 (in other words 77,7 % : 22,3 %). This preponderance of the one kind of hobby can probably be explained by the fact that many medallists practised one or more kinds of sport besides their hobbies and therefore probably did not really experience a need for an "active hobby".

In a separate questionnaire the medallists were asked whether they practised mathematics as a hobby by voluntarily reading mathematical articles and/or attending lectures on the subject. Of the 90 medallists who answered this question, 48 (53,3 %) indicated that this was in fact the case. This was apparently another factor that helped to develop the cognitive ability of the medallist.

TABLE 2.13

HOBBIES THAT WERE PRACTISED BY MEDALLISTS WHILE AT SCHOOL AS WELL AS IN LATER LIFE

Hobby	School		Adult	
Passive hobby	N	%*	N	%*
No information	33	-	59	-
Stock exchange	2	1,5	1	1,0
General science	2	1,5	-	-
Lighting	1	0,8	-	-
Ventriloquism	-	-	1	1,0
Photography	14	10,7	9	8,6
Geology	1	0,8	-	-
History	1	0,8	1	1,0
Dog training	1	0,8	-	-
Journalism	-	-	1	1,0
Conjuring	1	0,8	1	1,0
Art needlework	3	2,3	1	1,0
Reading	39	29,8	19	18,1
Model aeroplanes	1	0,8	-	-
Music: Playing an instrument	14	10,7	5	4,8
Music: Listening	14	10,7	10	9,5
Nature studies	5	3,8	4	3,8
Politics	3	2,3	2	1,9
Amateur radios	2	1,5	1	1,0
Travelling	2	1,5	1	1,0
Computer work	27	20,6	8	7,6
Music: Singing	1	0,8	-	-
Painting	3	2,3	2	1,9
Calligraphy	1	0,8	1	1,0
Sociology	1	0,8	-	-
Games: Other	1	0,8	-	-
Games: Cards	5	3,8	9	8,6
Games: Chess	12	9,2	8	7,6
Sports spectator	5	3,8	2	1,9
Astronomy	3	2,3	1	1,0
Visiting the theatre	2	1,5	3	2,9
Collecting precious stones	1	0,8	1	1,0
Collecting other items	1	0,8	1	1,0
Collecting coins	1	0,8	-	-
Collecting stamps	11	8,4	5	4,8
Collecting shells	1	0,8	1	1,0
Mathematical problems	7	5,3	2	1,9
TOTAL	189		101	

Hobby	School		Adult	
Active hobby	N	%*	N	%*
No information	33		59	
Ballet	1	0,8	-	-
Mountaineering	1	0,8	-	-
Archery	1	0,8	-	-
Surfing	-	-	2	1,9
Dancing	-	-	1	1,0
Cycling	2	1,5	1	1,0
Golf	2	1,5	3	2,9
Woodwork	4	3,1	2	1,9
Camping	1	0,8	2	1,9
Canoeing	1	0,8	-	-
Cross country/ Jogging	3	2,3	2	1,9
Car/Motorcycle sport	2	1,5	1	1,0
Car reparations	1	0,8	-	-
Squash	2	1,5	2	1,9
Horseriding	2	1,5	-	-
Sailing	5	3,8	2	1,9
Scuba diving	3	2,3	3	2,9
Snow skiing	2	1,5	-	-
Swimming	2	1,5	1	1,0
Tennis	4	3,1	1	1,0
Home exercises	1	0,8	-	-
Flying	-	-	1	1,0
Hiking	7	5,3	5	4,8
TOTAL	47		29	

* % The percentage was computed by expressing the number as a percentage of the number of medallists - 131 (school)/105 (adult).

2.3 SCHOLASTIC TRAINING

2.3.1 Schools attended: type and province

With regard to the scholastic training of the medallist, Table 2.14 shows that 86 of the 164 (52,4 %) attended provincial schools, while 78 (47,6 %) attended provincially aided or private schools. Generally speaking somewhat more medallists therefore attended provincial than provincially aided or private schools, except in Natal where the opposite was true.

The number of medallists per province (see Table 2.14) refers to the province in which the school that each medallist attended was situated, and not necessarily the province in which the parents of each medallist lived. The Transvaal as a province clearly yielded the largest number of winners (61 out of 164, in other words 37,2 %), followed by the Cape, Natal, the Orange Free State and SWA.

TABLE 2.14
NUMBER OF MEDALLISTS ACCORDING TO PROVINCE

Province	Type of school					
	Provincial		Provincially aided or private		Total	
	Number	%	Number	%	Number	%
Cape	29	17,7	22	13,4	51	31,1
Natal	21	12,8	26	15,9	47	28,7
Orange Free State	4	2,4	0	0	4	2,4
Transvaal	32	19,5	29	17,7	61	37,2
South West Africa	0	0	1	0,6	1	0,6
TOTAL	86	52,4	78	47,6	164	100

TABLE 2.15

TOTAL NUMBER OF WHITE PUPILS IN STANDARD TEN BETWEEN 1966 AND 1983, AND NUMBER OF MEDALS AWARDED

Year	Number of pupils (P) and number of medals (M) awarded per province																			
	Cape				Natal				O F S				Transvaal				Total			
	Provincial		Provincially aided and private		Provincial		Provincially aided and private		Provincial		Provincially aided and private		Provincial		Provincially aided and private		Provincial		Provincially aided and private	
	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M
1966		1		1		3		2		-		-		2		1		6		4
1967	7 583	3	1 381	2	2 905	-	820	3	2 330	-	137	-	12 135	-	1 274	2	24 953	3	3 612	7
1968	7 444	3	1 206	3	3 137	-	845	1	2 480	-	157	-	12 499	2	2 066	1	25 560	5	4 274	5
1969	7 778	2	1 253	1	3 160	-	830	1	2 511	-	154	-	12 865	2	2 046	5	26 314	4	4 283	7
1970	9 840	1	1 347	3	3 762	-	820	1	2 827	-	145	-	16 089	3	1 603	1	32 518	4	3 915	5
1971	9 989	4	1 323	1	3 775	1	837	3	3 007	-	146	-	16 752	-	1 560	1	33 523	5	3 866	5
1972	10 427	3	1 354	3	4 253	1	1 044	1	3 037	-	168	-	17 976	1	1 622	1	35 693	5	4 188	5
1973	10 884	1	1 316	1	4 580	2	1 120	1	3 348	-	136	-	19 064	4	1 712	1	37 876	7	4 284	3
1974		2		-		-		-		3		-		3		2	40 054	8	4 541	2
1975		1		3		3		1		1		-		1		-	39 383	6	4 101	4
1976	13 109	2	1 195	-	4 970	1	910	3	3 867	-	117	-	20 726	1	2 102	3	42 672	4	4 324	6
1977	13 182	-	1 254	-	5 337	2	956	1	3 692	-	75	-	26 519	2	2 253	5	48 730	4	4 538	6
1978	13 671	1	1 192	1	5 513	-	937	-	3 984	1	66	-	24 279	2	2 741	4	47 447	4	4 936	5
1979	14 026	1	1 121	1	5 862	-	946	2	4 028	1	96	-	24 865	3	2 788	2	48 781	5	4 951	5
1980[1]	13 999	4	1 054	1	5 210	2	848	-	4 051	-	83	-	26 388	1	3 063	2	49 648	7	5 048	3
1981	14 225	-	1 026	3	5 747	2	942	2	4 220	-	87	-	26 291	1	3 129	-	50 483	3	5 184	5[4]
1982	14 067	1	1 056	-	5 885	2	985	2	3 986	-	82	-	26 056	2	3 099	1	49 994	5	5 222	3
1983	14 188	1	955	-	6 055	2	1 071	3	4 046	-	81	-	26 452	3	3 153	1	50 741	6	5 260	4
TOTAL A[2]		31		24		21		27		6		-		33		33		91		84[4]
TOTAL B[3]	174 412	27	18 033	20	70 151	15	13 911	24	51 414	2	1 730	-	308 956	27	34 211	30	604 933	71	67 685	74

1) The 1980 figures for provincial and provincially aided or private schools were computed with the aid of ratios.

2) TOTAL A: The total number of medals that were awarded between 1966 and 1983.

3) TOTAL B: These totals do not include the Std 10 pupil numbers of 1966, 1974 and 1975, as the figures are not available.

4) These two totals do not include the medal won by a girl from SWA in 1981; the figures for SWA were not taken into account in this table.

Source: Annual reports of the Central Statistical Services.

Tables 2.15 and 2.16 (the latter merely summarise the figures used in Table 2.15) carry the above division of the medallists a little further by comparing the number of medallists with the total number of White Std 10 pupils attending provincial and provincially aided or private schools. The Std 10 pupils from the other population groups are at this stage not taken into account, since the number of medallists among them is too small to compute meaningful ratios for each population group. It should also be remembered that the Std 10 pupil numbers for 1966, 1974 and 1975 have not been included in the calculations, as the required classifications were not available in the annual reports of these years.

The following perspective can now be obtained: First of all, as there are certain medallists who won medals more than once (see Paragraph 2.1.2), Table 2.15 (Total A) shows that a total number of 175 (91 + 84) medals have been awarded in the RSA to the 163 medallists (one medal was awarded to a pupil from South West Africa). Secondly, despite the fact that the Std 10 pupil numbers for the years mentioned are not available, the totals from the other years show very clearly how selected and special a group of pupils the medallists in fact are. The 71 medals that have been awarded to pupils in provincial schools out of a possible total of 604 933 pupils, represent 0,012 % of the total number of pupils - in other words 12 out of every 100 000 pupils, or one out of every 8 520 pupils. This percentage increases to 0,11 % - in other words 110 out of every 100 000 pupils, or one out of every 917 pupils - in the case of the provincially aided and private schools. The total number of 145 medals awarded during the years concerned, represents 0,022 % of the 672 818 Std 10 pupils over that period, in other words 22 out of every 100 000 pupils or one out of every 4 640 pupils. If it is furthermore taken into account that Std 8 and Std 9 pupils have also won medals to date, it simply adds to the achievement of being crowned as a medallist.

It is also clear from Table 2.16 that Natal as a province has proportionally maintained the best performance with regard to winning medals. During the years mentioned, medals were awarded to 39 pupils in Natal out of a total number of 84 062 matriculants, in other words one medal for every 2 155 pupils. Transvaal pupils indeed won the largest number of medals (57), but in proportion to the 343 167 Std 10 pupils in the

TABLE 2.16

TOTAL NUMBER OF WHITE PUPILS IN STANDARD TEN AND THE TOTAL NUMBER OF MEDALS AWARDED BETWEEN 1967 AND 1973, AS WELL AS BETWEEN 1976 AND 1983. SEE TOTAL B OF TABLE 2.15

Province	Type of school					
	Provincial		Provincially aided and private		Total	
	Std 10 pupils	Medals	Std 10 pupils	Medals	Std 10 pupils	Medals
Cape	174 412	27	18 033	20	192 445	47
Natal	70 151	15	13 911	24	84 062	39
Orange Free State	51 414	2	1 730	0	53 144	2
Transvaal	308 956	27	34 211	30	343 167	57
South West Africa	Not taken into account					
TOTAL	604 933	71	67 885	74	672 818	144

province during the years mentioned, the ratio obtained is one medal for every 6 020 pupils. In the Cape the ratio is one medal for every 4 095 pupils and in the Free State it is one medal for every 26 572 pupils. When these ratios are all considered it should, however, be borne in mind that in the particular divisions distinctions were not drawn between the provincial and provincially aided or private schools. It can therefore not simply be assumed that the teaching or subject curriculum of one education department is better than that of another.

Another matter not reflected in the preceding tables, is that according to information supplied by the Transvaal Education Department 11 of the 61 medallists who matriculated from Transvaal schools (in other words 18,0 %) wrote internal mathematics examinations. Internal examinations imply that either the school as a whole was a project school and that candidates wrote an internal matriculation examination in all their subjects, or that the mathematics teachers of the pupil(s) involved were accredited teachers, in which case the candidates would only write an internal mathematics paper, while the other papers would be drawn up externally.

Regarding the schools where the medallists received their scholastic training, Table 2.17 reveals that the 164 winners attended a total of 79 schools. Of these 36 (45,6 %) were in the Transvaal, 21 (26,6 %) in the Cape, 17 (21,5 %) in Natal, 4 (5,0 %) in the Orange Free State and one (1,3 %) in SWA. Table 2.17 also shows that 50 of the 79 schools have so far yielded only one medallist each; that 13 could boast two winners each, etc., up to the one school that had actually been responsible for the scholastic training of no less than 12 medallists. When this number of schools is considered in proportion to the total number of White secondary schools in the RSA, Table 2.17 indicates that 9,9 % (79 out of 802) of the total number of schools have so far managed to yield a medallist. If a comparison is drawn between the different provinces, it would seem that Natal had a better distribution of schools (17,4 % of the schools in Natal had medallists) than the Cape and Transvaal where numerically more schools yielded medallists. Figure 2.2 shows the ratio of the number of medallists to the number of schools that accommodated medallists by dividing the number of medallists by the number of schools involved. It can be gathered from this figure that

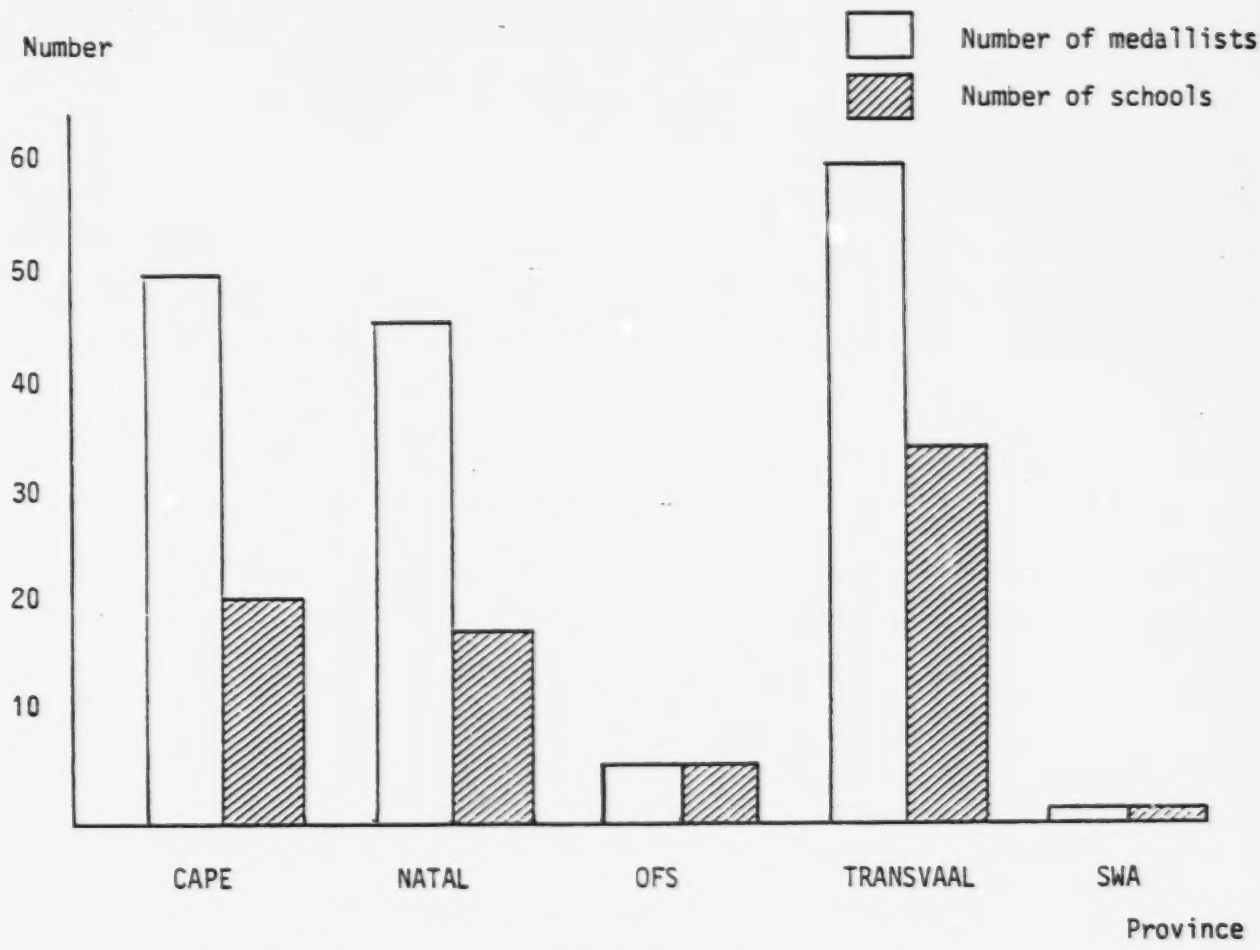
TABLE 2.17
NUMBER OF SCHOOLS PER PROVINCE YIELDING MEDALLISTS

Province	Number of schools with number of medallists per school													%	Number of schools	
	1	2	3	4	5	6	7	8	9	10	11	12	Total	A*	Number	% B*
Cape Province	12	3	-	2	-	3	1	-	-	-	-	-	21	26,6	306	6,9
Natal	11	1	-	-	2	2	-	-	-	-	-	1	17	21,5	98	17,4
Orange Free State	4	-	-	-	-	-	-	-	-	-	-	-	4	5,0	92	4,4
Transvaal	22	10	1	2	-	-	-	1	-	-	-	-	36	45,6	306	11,8
South West Africa	1	-	-	-	-	-	-	-	-	-	-	-	1	1,3	-	-
TOTAL	50	13	1	4	2	5	1	1	-	-	-	1	79	100	802	9,9

* Percentage A: The total per province expressed as a percentage of the total number of schools where there were medallists (i.e. 79).

* Percentage B: The total per province expressed as a percentage of the total number of secondary schools in the particular province. (Only the number of White secondary schools were used in these calculations, because the other population groups were divided according to educational statistics reports per region and not per province: HSRC Register of Schools of 1981.)

FIGURE 2.2 NUMBER OF MEDALLISTS AND MEDAL WINNERS SCHOOLS PER PROVINCE



the average number of winners per school in the Cape was 2,4, in Natal 2,8, in the OFS 1,0, in the Transvaal 1,7 and in SWA 1,0.

The school that has so far yielded the largest number of medallists, namely 12, is a government-aided English medium school for boys in the Midlands of Natal. Second is a private English medium school for boys in Johannesburg with 8 medallists and third another private English medium school for boys in Cape Town with 7 medallists.

2.3.2 Standard 10 subjects and distinctions obtained

The analysis of the scholastic performance of the medallists in this paragraph is based on the information that was received from 145 of the 164 medallists.

Table 2.18 reveals that the 145 medallists obtained a total of 591 distinctions in their Standard 10 examinations, an average of 4,1 distinctions per medallist. The mean number is 3,4 distinctions while the mode is 3 - in other words, the particular number of distinctions that has the highest frequency. In this case there were 33 medallists who each obtained three distinctions. Only one of the winners did not get any distinctions (thus not in mathematics either), whereas four of the medallists obtained eight distinctions each. The "Cumulative percentage" column of Table 2.18 indicates *inter alia* that 42,8 % of the medallists obtained three or fewer distinctions, while 57,2 % obtained more than three distinctions.

Figure 2.3 is a graphic representation of Table 2.18.

The subject listed in Table 2.19 are those in which medallists managed to obtain distinctions. The designations HG (Higher Grade) and SG (Standard Grade) were introduced in 1975 only and it is therefore assumed that before 1975 candidates wrote their subjects on the higher grade.

It is clear from Table 2.19 that 99,3 % of the 145 medallists from whom this information was received obtained a distinction in mathematics, 93,1 % in physical science and 35,9 % in additional mathematics. These

TABLE 2.18
NUMBER OF MEDALLISTS PER NUMBER OF DISTINCTIONS

Number of distinctions	Number of medallists (f)	Number X frequency (f)	Cumulative frequency (f)	Percentage of 145	Cumulative percentage
No information was received	19				
0	1	0	1	0,7	0,7
1	4	4	5	2,8	3,5
2	24	48	29	16,5	20,0
3	33	99	62	22,8	42,8
4	26	104	88	17,9	60,7
5	25	125	113	17,2	77,9
6	17	102	130	11,7	89,6
7	11	77	141	7,6	97,2
8	4	32	145	2,8	100
TOTAL	145	591	145	100,0	100

FIGURE 2.3 NUMBER OF DISTINCTIONS PER MEDALLIST

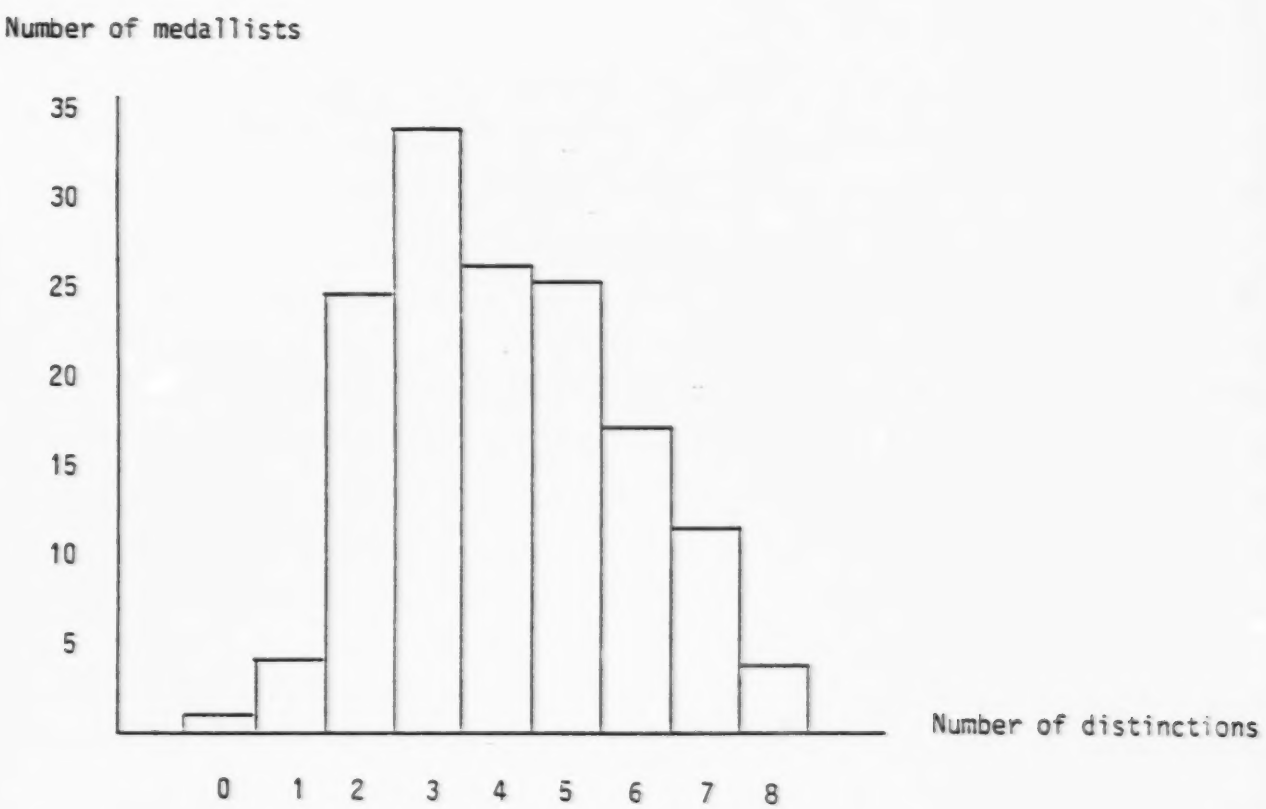


TABLE 2.19

STANDARD TEN SUBJECTS AND RELATED NUMBER OF DISTINCTIONS

Subjects	Number of distinctions	* Percentage
No information received - 19 candidates		
Afrikaans First Language HG	18	12,4
Afrikaans Second Language HG	18	12,4
English First Language HG	38	26,2
English Second Language HG	12	8,3
German Home Language HG	1	0,7
German Third Language HG	7	4,8
French HG	5	3,5
Hebrew HG	1	0,7
Latin HG	38	26,2
Zulu SG	1	0,7
Geography HG	24	16,6
History HG	17	11,7
Biology HG	34	23,5
Physical Science HG	135	93,1
Mechanics HG	9	6,2
Mathematics HG	144	99,3
Additional Mathematics HG	52	35,9
Applied Mathematics HG	2	1,4
Computer Studies SG	18	12,4
Business Economics SG	1	0,7
Economics HG	1	0,7
Accountancy HG	15	10,4
Total	591	

* Percentage: The number of distinctions as a percentage of the 145 medallists from whom this information was obtained.

results are a good indication that the medallists' aptitude and/or interest lay in the direction of a natural sciences field of study. The fact that all the medallists (except for one) also obtained distinctions in mathematics, points to the high degree of validity of the Mathematics Olympiad as a criterion for aptitude in mathematics.

Another noteworthy facet that evolves from the table is the large number of language distinctions. This may point to a large degree of co-variance between mathematical and verbal ability.

Something not indicated in Table 2.19, however, is that at least 69 medallists took Additional Mathematics as a Standard 10 subject. This group of pupils had a clear advantage in the development of their cognitive ability over their fellows who had to contend with the normal number of mathematics periods at school.

2.3.3 Special preparation with a view to the Mathematics Olympiad

Just over half of the 90 medallists from whom information was obtained on their preparations for the Mathematics Olympiad (that is, 51 or 56,7 %), indicated that they prepared themselves specifically for the olympiad (see Table 2.20). Most of the time such preparations involved the working through of previous years' papers either by the candidates on their own, or in consultation with their mathematics teacher. The remaining 43,3 % probably just prepared at another level.

TABLE 2.20
MEDALLISTS: PREPARATION FOR MATHEMATICS OLYMPIAD

	Number	%
Prepared themselves	51	56,7
Did not specially prepare themselves	39	43,3
TOTAL	90	100

2.3.4 Mathematics club

The surveys revealed the following alarming facts:
Only 5,6 % (5 out of 90) of the medallists from whom this information was obtained belonged to a mathematics club (see Table 2.21). The reason 94,4 % did not belong to one can probably be attributed to the absence of such clubs at these schools and this points to a real shortcoming at many schools.

TABLE 2.21
MEDALLISTS: MEMBERSHIP OF A MATHEMATICS CLUB

	Number	%
Member of a club	5	5,6
Not a member of a club	85	94,4
TOTAL	90	100

2.3.5 Pupil council

It seems from Table 2.22 that just over half of the medallists served on the pupil councils of their respective schools. The group of 133 medallists who supplied information on this matter includes, according to the table, 7 (5,3 %) dux pupils, 6 (4,5 %) head prefects, 7 (5,3 %) vice-head prefects and 50 (37,6 %) others who served as ordinary pupil council members.

TABLE 2.22
MEDALLISTS: SELECTED TO THE PUPIL COUNCIL

Position on the pupil council	Number	%
No information was received	31	
Did not serve on the pupil council	63	47,4
Ordinary member of pupil council	50	37,6
Vice-headboy/vice-headgirl	7	5,3
Headboy/headgirl	6	4,5
Dux pupil	7	5,3
TOTAL	133	100,1

2.4 ACADEMIC TRAINING ON THE TERTIARY LEVEL

2.4.1 Fields of study

The data reflected in this paragraph are based on the information received from 126 medallists. It is clear from Table 2.23 that 70 of the 126 medallists (in other words 55,6 %) were registered as students at a university at the time of the questionnaire survey and that 44 of them had not yet obtained a degree at that stage. It furthermore appeared that 80 (63,5 % of the 126) had already obtained a degree. This means that 124 (44 + 80) of the 126 in fact receive(d) university training, whereas one medallist apparently obtained a different kind of tertiary diploma. In the group as a whole there was thus a single medallist who did not fall in the group with tertiary training.

When the 81 medallists who had already obtained a tertiary qualification (as reflected in Tables 2.23 and 2.24) are referred to, it should be borne in mind that only the highest qualification has been taken into account. For example, when a person had obtained a D.Sc. degree, it was considered in the above counting as one degree despite the fact that such a person had *ipso facto* obtained the B.Sc., B.Sc. (Hons.) and M.Sc. degrees.

Among the 80 medallists already mentioned there was a group of 13 who had also obtained a degree in a field of study other than that of their first degree. When in Table 2.23 reference is therefore made to "degrees in two different fields of study", what is meant,is degrees completely different in nature, for example B.Sc. and M.B.A.

In Table 2.24 the total number of medallists who had already obtained a tertiary qualification is given as 94 - which is the total of the above 80 and 13 degrees and one diploma. Table 2.24 also gives an exposition of the university degrees for which the medallists were enrolled at the time of the questionnaire survey and those degrees that had already been obtained. From this it seems that the majority of degrees obtained by medallists were in a purely natural sciences field of study (46 out of 94, in other words 48,9 %), followed by engineering in the second place (22 out of 94, in other words 23,4 %).

Qualifications were also to a smaller extent obtained in the literary (8,5 %), commercial (8,5 %), medical 7,4 %), architectural (1,1 %), theological (1,1 %) and military (1,1 %) fields of study.

When a comparison is drawn between the degrees already obtained (as reflected in Table 2.24) and those for which the medallists were still registered at the time of the questionnaire survey, two clear changes can be discerned: a decrease in the number of medallists who registered as students in the pure natural sciences (48,9 % to 35,7 %) and an increase in the number who registered as medical students (7,4 % to 14,3 %).

TABLE 2.23
UNIVERSITY TRAINING OF MEDALLISTS: FINISHED AND UNFINISHED DEGREES

	Number	Total	%
No information was received	38		
Registered students at the time of the questionnaire survey		70	55,6
(a) Registered for the first time	44		34,9
(b) Registered but already obtained a degree	26		20,6
Already obtained a university degree		80	63,5
Obtained university degrees in two different fields of study		13	10,3
No university training		2	
(a) Diploma	1		
(b) Standard 10	1		

It can also be deduced from Table 2.24 that the 94 qualifications obtained can be divided as follows:

48 B. degrees (51,1 %), 18 Hons. degrees (19,1 %), 21 M. degrees (22,3 %), 6 D. degrees (6,4 %) and one diploma (1,1 %).

Table 2.25 gives a summary of the fields of study selected by the 126 medallists from whom this information was received. On the whole

TABLE 2.24

TERTIARY QUALIFICATIONS - REGISTERED AT THE TIME OF THE SURVEY, AND ALREADY OBTAINED (HIGHEST DEGREE)

Degrees	Registered			Already obtained		
	Number	Total	%	Number	Total	%
No information was received	38			38		
Not registered at the time of the survey	56					
(1) Architecture: B. Arch.	-	-	-	1	1	1,1
(2) Commercial: B.Com.	5			2		
B.Com. (Hons)	-			1		
M.Com., Actuary (FFA)	2			4		
M.B.A., C.A.	1			1		
Ph.D. in M.B. Adm.	1	9	12,9	-	8	8,5
(3) Engineering: B.Eng.	13			15		
B.Eng. (Hons)	1			3		
M. Eng.	2			3		
D. Eng.	1	17	24,3	1	22	23,4
(4) Arts: B.A.	4			4		
B.A. (Hons)	1			3		
M.A.	1			1		
D.Litt.	1	7	10,0	-	8	8,5
(5) Medical: M.B. Ch.B.	8			6		
M.Med.	2			-		
M.Sc. (medical)	-	10	14,3	1	7	7,4
(6) Natural sciences: B.Sc.	18			20		
B.Sc. (Hons)	-			11		
M.Sc.	2			11		
D.Sc.	5	25	35,7	4	46	48,9
(7) Education: B.Ed.	1	1	1,4	-		
(8) Theology: B.Th.	1	1	1,4	-		
Diploma	-	-	-	1	1	1,1
(a) Military: D.Mil.	-	-	-	1	1	1,1
		70	100		94	100

TABLE 2.25

STUDY FIELDS OF THE MEDALLISTS AT TERTIARY LEVEL

Study field	Registered			Already completed		
	Number	Total	%	Number	Total	%
No information available	38			38		
Not registered at the time of the survey	56					
(1) Philosophy and religion:						
Philosophy	3					
Religious Studies	1			-		
Christian Theology	-			1		
Judaism	1	5	5,4	-	2	1,8
(2) Health care (Medical):						
Basic science	8			5		
Clinical science	3	11	11,8	2	7	6,1
(3) Engineering: Chemical	3			4		
Civil	2			6		
Electrical	8			4		
Electronical	-			3		
Mechanical	3			6		
Metallurgical	1			1		
Geological	-	17	18,3	1	25	21,9
(4) Communication: Technology	-			1		
Cybernetics	1	1	1,1	-	1	0,9
(5) Agriculture and natural resources:						
Zoology	1			-		
Botany	2			-		
Pedology	1	4	4,3	-	-	
(6) Literature: Literary Science	1			-		
Afrikaans or English	1			3		
Latin	-	2	2,2	1	4	3,5
(7) Biology and physical sciences:						
Astronomy	-			1		
Physics	6			10		
Biochemistry	-	6	6,5	1	12	10,5

(continued)

TABLE 2.25 (continued)

Study field	Registered			Already obtained		
	Number	Total	%	Number	Total	%
(8) Physical education:						
Physiology	-	-		1	1	0,9
(9) Computer science:						
Basic	8			2		
Software	1	9	9,7	-	2	1,8
(10) Business, commercial and management sciences:						
Banking	-			1		
Management Science	1			3		
Marketing	1			-		
Entrepreneurship	2			1		
Personnel Management	1			1		
Accountancy	2	7	7,5	-	6	5,3
(11) Psychology: Clinical	-	-		1	1	0,9
(12) Social sciences:						
Political Science	-	-		1	1	0,9
(13) Mathematics:						
General perspectives	-			1		
Classical analysis	17			21		
Functional analysis	-			1		
Mathematical statistics	3			12		
Numerical analysis (Actuarial)	5			9		
Applied Mathematics	6	31	33,3	8	52	45,6
		93			114	

it seems that by far the highest percentage of medallists (45,6 %) were pursuing a study of mathematics, while engineering took the second place with 21,9 %. Other fields of study were less popular. A comparison between the fields of study in which degrees had already been completed and the fields of study for which the medallists were registered at the time of the questionnaire survey, points to a noteworthy decrease in the number of medallists who studied mathematics (45,6 % to 33,3 %), while there was a definite increase in the number who studied computer science. The other fluctuations that could be noticed are of lesser importance for this study.

An interesting phenomenon not mentioned in the tables above is that 22 of the 126 medallists referred to (in other words 17,5 %) obtained their degrees *cum laude*.

NOTE

When analyzing the information summarized in Table 2.25, it is of prime importance to bear in mind that

- the total of 114 medallists under study "already completed" does not signify much, as some medallists took more than one major subject.

- a considerable number of medallists who had already completed a a study at a certain level again registered for the same field of study at an advanced level, or for another field of study.

It would therefore be *wrong* to allege for example that 83 (31 + 52) different medallists studied mathematics.

2.4.2 Leadership positions occupied while engaged in tertiary study

Table 2.26 shows that 12 of the 104 medallists on whom information was obtained regarding leadership positions (in other words 11,5 %) served on the student council of their respective universities and that two even became chairmen of these representative bodies.

TABLE 2.26
LEADERSHIP POSITION AT UNIVERSITY

	Number	%
No information was received	60	
Did not serve on student council	92	88,5
Ordinary member of student council	10	9,6
Chairman of student council	2	1,9
TOTAL	104	100

2.5 PARTICIPATION IN CULTURAL ACTIVITIES AND SPORT

2.5.1 Participation in cultural activities

According to Table 2.27, based on the answers of the 132 medallists concerning their participation in cultural activities at school, and the 104 medallists with regard to their participation in cultural activities at tertiary institutions, it seems that at school, 43 (in other words 32,6 %) took part in no cultural activity, 38 (28,9 %) took part in only one cultural activity, 28 (21,2 %) in two and 23 (17,4 %) in three. While at school, 89 medallists therefore participated in some cultural activity or other. It also appears from Table 2.27 that of the 104 medallists mentioned, 56 (53,8 %) did not take part in a cultural activity during their tertiary study career, which implies that 48 (46,2 %) did in fact take part in such activities.

TABLE 2.27

NUMBER OF MEDALLISTS WHO TOOK PART IN A CULTURAL ACTIVITY

	At school		After leaving school	
	Number	%	Number	%
No information was received	32		60	
No participation in cultural activities	43	32,6	56	53,9
One activity	38	28,9	33	31,7
Two activities	28	21,2	13	12,5
Three activities	23	17,4	2	1,9
TOTAL	132	100,1	104	100

Regarding the leadership positions that medallists held in the cultural sphere, Table 2.28 reveals that as far as the school is concerned, 10 medallists (7,6 %) served on a committee, while 17 others (12,9 %) acted as chairmen. At tertiary level 15 (14,4 %) medallists served on a committee, while 5 others (4,8 %) were the chairmen of cultural societies.

TABLE 2.28

LEADERSHIP POSITIONS IN CULTURAL ACTIVITIES OCCUPIED BY MEDALLISTS

	At school		After leaving school	
	Number	%	Number	%
No information was received	32		60	
No participation in cultural activities	43	32,8	56	53,9
No leadership position	81	61,4	35	33,7
On the committee	10	7,6	15	14,4
Chairman	17	12,9	5	4,8
TOTAL	151*	114,7*	111*	106,8*

* The totals do not correspond with the totals of Table 2.27, because one medallist may for example be chairman of the cultural society, vice-chairman of another cultural society and an ordinary member of a third cultural society.

Table 2.29 provides a detailed exposition of the participation of the medallists in cultural activities. In order to prevent confusion, attention should be drawn to the fact that the totals 163 and 65 are in reality only useful for computing the percentages of levels of participation, because the *medallists* took part in different *numbers* of cultural activities. For this reason the total number of medallists from whom feedback had been obtained was used to compute percentages for each cultural activity. According to Table 2.29 the three cultural activities that were most popular with medallists while they were at school were the following: debating contests (44 out of 132, in other words 33,3 % took part in these), subject societies (28 out of 132, i.e. 21,2 %) and church youth movements (18 out of 132, i.e. 13,6 %). At tertiary level the order of popularity was, subject societies (15,4 %), church youth movements (10,6 %) and the editorial staff of the house magazines or newspapers published by the respective institutions.

Table 2.29 also shows that the level of participation at school and while studying at the tertiary institution could in the case of 78,5 % of the medallists be described as "mere participation", while 12,9 % represented their school and 16,9 % their tertiary institution in the cultural sphere. The other levels of participation can also be noted in this table.

Finally Table 2.29 also indicates that 19 different kinds of cultural activities were practised by the medallists at school level, and 16 at tertiary level.

TABLE 2.29
CULTURAL ACTIVITIES OF THE MEDALLISTS

Cultural activity	Level of perception													
	Mere participation		Represented S* or T*		Represented region		Represented province		Represented country		Total		Total	
	S	T	S	T	S	T	S	T	S	T	School	%	Tertiary institution	
	N	N	N	N	N	N	N	N	N	N	N	%**	N	%**
No information											32		60	
Foreign affairs	2	-	-	-	-	-	-	-	-	-	2	1,5	-	-
Drama /theatre	6	3	1	-	-	-	-	-	-	-	7	5,3	3	2,9
Film society	1	-	-	-	-	-	-	-	-	-	1	0,8	-	-
History	2	2	-	-	-	-	-	-	-	-	2	1,5	2	1,9
Youth movements	6	5	1	-	-	-	2	-	-	-	9	6,8	5	4,3
Church youth movements	17	10	1	-	-	1	-	-	-	-	18	13,6	11	10,6
Choir	9	1	2	1	1	-	-	-	-	-	12	9,1	2	1,9
Cultural society	1	2	-	3	-	-	-	-	-	-	1	0,8	5	4,8
Art society	3	-	-	1	-	-	-	-	-	-	3	2,3	1	1,0
Literary society	4	1	-	-	-	-	-	-	-	-	4	3,0	1	1,0
Musical instrument	6	2	-	1	1	-	-	-	-	-	7	5,3	3	2,9
Orchestra	-	1	3	-	-	-	-	-	1	2	4	3,0	3	2,9
Political study	3	2	1	-	-	-	-	-	-	-	4	3,0	2	1,9
Editorial staff *** S/U publication	4	5	4	2	-	-	-	-	-	-	8	6,1	7	6,7
Debating competit.	30	1	8	-	3	-	2	-	1	-	44	33,3	1	1,0
Sports club	-	-	-	1	-	-	-	-	-	-	-	-	1	1,0
Exchange student	4	-	-	-	-	-	-	-	2	-	6	4,5	-	-
Technical associat.	27	14	-	2	-	-	-	-	1	-	28	21,2	16	15,4
Collectors' club	1	2	-	-	-	-	-	-	-	-	1	0,8	2	1,9
Ethnology	2	-	-	-	-	-	-	-	-	-	2	1,5	-	-
TOTAL	128	51	21	11	5	1	4	-	5	2	163		65	
PERCENTAGE	78,5	78,5	12,9	16,9	3,1	1,5	2,5	-	3,1	3,1				

* S = School, T = Tertiary institution

** %: The total is expressed as a percentage of the 132(S)/104(T) medallists from whom information was obtained.

*** S/U publication = School or university publication

2.5.2 Participation in sport

As became clear from the paragraph on participation in cultural activities, 132 medallists also provided information on their participation in sport at school and 104 on their participation in sport at tertiary level. According to Table 2.30 it seems that at school level 22 % (29 of 132) of the medallists practised only one type of sport, 28 % (37 out of 132) two kinds of sport and 32,6 % (43 out of 132) three kinds of sport - a total of 82,6 % of the medallists thus practised a sport. However, at tertiary level a smaller number took part in sport, namely a total of 65,4 % (68 out of 104). Twenty-six comma nine per cent played a single kind of sport, 20,2 % two kinds of sport and 18,3 % three kinds of sport.

Table 2.31 reveals that of the medallists who held leadership positions in sport at school, 7 (5,3 %) were vice-captain and 20 (15,2 %) captain of some or other sports team. At tertiary level the corresponding figures were seven (6,7 %) and six (5,8 %) respectively.

Table 2.32 provides an exposition of the medallists' participation in sport. As in Table 2.29 it should be noted that the totals 232 and 127 were only used to calculate the percentages at the "level of participation", and the number of medallists from whom feedback was received was used to compute the percentages for each kind of sport. According to Table 2.32 rugby was the mostpopular sport pursued at school (35 out of 132, or 26,5 % of the medallists), with hockey in the second place (21,2 %) and tennis (20,5 %), athletics (18,2 %) and chess (18,2 %) not far behind. At tertiary level, squash proved to be by far the most popular sport with 26 % of the medallists playing it. Cross country (10,6 %), rugby (9,6 %), tennis (9,6 %), chess (7,7 %) and mountaineering (6,7 %) were next on the popularity list, followed by other less popular kinds of sport.

TABLE 2.30 NUMBER OF MEDALLISTS WHO TOOK PART IN SPORT

	At school		After leaving school	
	Number	%	Number	%
No information was received	32		60	
Did not participate in sport	23	17,4	36	34,6
One sport	29	22,0	28	26,9
Two kinds of sport	37	28,0	21	20,2
Three kinds of sport	43	32,6	19	18,3
TOTAL	132	100	104	100

TABLE 2.31 LEADERSHIP POSITIONS IN SPORT OCCUPIED BY MEDALLISTS

	At school		After leaving school	
	Number	%	Number	%
No information was received	32		60	
Did not participate in sport	23	17,4	36	34,6
Did not occupy a leadership position	100	75,8	61	58,7
Vice-captain	7	5,3	7	6,7
Captain	20	15,2	6	5,8
TOTAL	150*	113,7*	110	105,8*

* The totals do not correspond with those in Table 2.30, because one of the medallists may for example be the captain of one sports team, vice-captain of another sports team and hold no leadership position in a third sport.

TABLE 2.32

MEDALLISTS' PARTICIPATION IN SPORT

Kind of sport	Level of participation												Percentage*	
	Mere participation		First team		Regional team		Provincial team		S.A. team		Total			
	S**	T**	S	T	S	T	S	T	S	T	S	T	School	Tertiary
	N	N	N	N	N	N	N	N	N	N	N	N		
No information received	-	-	-	-	-	-	-	-	-	-	32	60		
Aerobatics	-	1	-	-	-	-	-	-	-	-	-	1	-	1,0
Athletics	14	1	9	-	-	-	1	1	-	-	24	2	18,2	1,9
Basketball	3	-	-	-	-	-	-	-	-	-	3	-	2,3	-
Mountaineering	3	6	-	1	-	-	-	-	-	-	3	7	2,3	6,7
Cycling	1	3	-	-	-	-	-	1	-	-	1	4	0,8	3,8
Weight-lifting	-	1	-	-	-	-	-	-	-	-	-	1	-	1,0
Golf	4	3	-	1	-	-	-	-	-	-	4	4	3,0	3,8
Gymnastics	1	-	-	-	-	-	2	-	1	1	4	1	3,0	1,0
Hockey	18	2	7	2	1	-	1	3	1	1	28	8	21,2	7,7
Judo	1	-	-	-	-	-	-	-	-	-	1	-	0,8	-
Canoeing	-	1	-	-	1	-	-	-	-	-	1	1	0,8	1,0
Karate	1	3	-	-	-	-	-	-	-	-	1	3	0,8	2,9
Smallbore rifle shooting	1	-	2	-	-	-	-	-	-	-	3	-	2,3	-
Power flying	-	1	-	-	-	-	-	-	-	-	-	1	-	1,0
Cricket	13	1	2	2	3	1	2	-	-	-	20	4	15,2	3,8
Cross country	3	5	4	3	1	2	-	1	-	-	8	11	6,1	10,6
Life-saving	-	-	-	-	1	-	-	-	-	-	1	-	0,8	-
Car/motorcycle sport	-	-	-	-	-	-	-	1	-	-	-	1	-	1,0
Squash	13	26	1	-	-	-	-	-	-	1	14	27	10,6	26,0
National shooting	-	-	-	-	1	-	-	-	-	-	1	-	0,8	-
Badminton	1	-	-	-	-	-	-	-	-	-	1	-	0,8	-
Polo/waterpolo	-	1	2	-	-	-	-	1	-	-	2	2	1,5	1,9
Rowing	-	1	2	-	-	-	-	-	-	-	2	1	1,5	1,0
Diving	-	-	-	-	-	-	1	-	-	-	1	-	0,8	-
Rugby	28	5	7	5	-	-	-	-	-	-	35	10	26,5	9,6
Baseball	1	-	-	-	-	-	-	-	-	-	1	-	0,8	-
Yachting	2	2	-	2	-	-	1	-	-	-	3	4	2,3	3,8
Chess	11	6	8	1	1	-	4	1	-	-	24	8	18,2	7,7
Fencing	-	-	-	-	-	-	1	-	-	-	1	-	0,8	-
Scuba diving	-	-	-	1	-	-	-	1	-	-	-	2	-	1,9
Snow skiing	-	2	-	-	-	-	-	-	-	-	-	2	-	1,9
Swimming	4	1	3	-	4	-	-	-	-	-	11	1	8,3	1,0
Table tennis	3	2	-	-	-	-	-	-	-	-	3	2	2,3	1,9
Tennis	20	10	6	-	-	-	-	-	-	-	26	10	20,5	9,6
Parachuting	-	1	-	-	-	-	-	-	-	-	-	1	-	1,0
Pedal car racing	-	1	-	-	-	-	-	-	-	-	-	1	-	1,0
Volleyball	2	3	-	-	-	-	-	-	-	-	2	3	1,5	2,9
Soccer/football	3	4	-	-	-	-	-	-	-	-	3	4	2,3	3,8
TOTAL	151	93	53	18	13	3	13	10	2	3	232	127		
Percentage	65,1	73,2	22,8	14,2	5,6	2,4	5,6	7,9	0,9	2,4				

* Percentage: The "Total" expressed as a percentage of the 132 (school) 104 (tertiary institution) medallists from whom this information was actually received.

** S = School T = Tertiary institution

Table 2.32 furthermore reveals that the level of participation in sport at school can in the cases of 65,1 % of the medallists be described as "mere participation". The corresponding figure at tertiary level is 73,2 %. However 22,8 % and 14,2 % of the medallists respectively played in a first sports team for their school and/or tertiary institution. The additional levels of participation are also given in Table 2.32.

In all, medallists participated in 30 different kinds of sport during their respective school careers and in 29 at tertiary level.

An inference from Tables 2.29 and 2.32 is that as a general trend, participation in sport and cultural activities shows a marked decline from school to tertiary level. The decrease is particularly obvious in team sport. Individual or smaller group type sport replaces it.

2.6 MILITARY SERVICE

Table 2.33 reflects the information on military service received from 127 medallists. It appears that 58 of the 127 medallists (i.e. 45,7 %) had already completed their military service, while 59 (i.e. 46,4 %) had not, either because they had not been called up under the old dispensation or had been exempted, or their enlistment date had been postponed for some reason. Ten of the medallists were girls and as the RSA does not have compulsory military service for women, this matter does not apply to them.

TABLE 2.33
MILITARY SERVICE COMPLETED BY MEDALLISTS

	Number	%
No information was received	37	
Girls	10	7,9
Have not yet done any military service	59	46,4
Already completed military service	58	45,7
TOTAL	127	100

2.7 OCCUPATIONS OF MEDALLISTS

The data concerning the occupations of medallists contained in Table 2.34 are based on the information received from 118 medallists. What strikes one first is that all the occupations fall in the group "Professional or semiprofessional occupations" - compare Table 2.6 and Table 2.9 which respectively contain information on the occupations of the fathers and mothers of medallists. In the group of 118 medallists mentioned there are 63 (53,4 %) who have a full-time occupation and 55 (46,6 %) who study full time. From Table 2.34 it can clearly be seen that the engineers form the biggest occupational group among them (16,1 % of the medallists), followed by arithmeticians (13,6 %), management scientists (6,8 %), educationists (5,9 %), physicians (4,2 %), physical scientists (3,4 %), clergymen (1,7 %), architects (0,85 %) and housewives (0,85 %).

Fifteen of the medallists previously followed an occupation other than that indicated in Table 2.34. Among them there were 4 researchers, 2 teachers, 6 lecturers, 1 computer programmer, 1 actuary and 1 engineer.

Table 2.35 shows that the largest group of medallists who are practising a profession at present are working in the private sector (31 % of the 113 medallists). The "Other government-supported institutions" that are referred to include institutions such as the CSIR and the Atomic Energy Board (UCOR, NUCOR).

2.8 MARITAL STATUS

It seems from Table 2.36 that more than half the medallists were not yet married at the time of the questionnaire survey. It was found that 82 of the 129 from whom information was obtained in this regard (i.e. 63,6 %) were still single, while 46 (i.e. 35,6 %) were married and 1 (i.e. 0,8 %) was divorced and had not married again. Only 26 children have so far been born from the 46 marriages mentioned.

As regards the occupational activities of the spouses of 42 of the 46 married medallists referred to above, Table 2.37 reveals that 24

TABLE 2.34 OCCUPATIONS OF MEDALLISTS

Occupation	Number	Total	Percentage
Not known what occupations are practised	46		
1) Architectural	1	1	0,85
2) Management sciences : Marketing	4		
Finance	1		
Production	1		
Planning	2	8	6,8
3) Physical sciences : Physicist	4	4	3,4
4) Religion: Clergyman	2	2	1,7
5) Housewife	1	1	0,85
6) Engineering: Chemical	2		
Electrical	2		
Electronical	3		
Mechanical	6		
Metallurgical	1		
Civil	4		
Did not specify	1	19	16,1
7) Medical: Physician	5	5	4,2
8) Educational: Teacher	2		
Lecturer	3		
Professor	2	7	5,9
9) Arithmetical: Actuary	12		
Systems analist	3		
Computer programmer	1	16	13,6
10) Full-time student	55	55	46,6
TOTAL	164	118	100

TABLE 2.35 TYPE OF EMPLOYER EMPLOYING MEDALLISTS

Type of employer	Number	%
No information available	51	
Own employer	2	1,8
Private institutions	35	31,0
Universities	6	5,3
Other government supported institutions	10	8,8
Education departments	1	0,9
Other government institutions	4	3,5
Full-time students	55	48,7
TOTAL	113	100

TABLE 2.36 NUMBER OF MEDALLISTS MARRIED

	Number	%
No information was received	35	
Never married	82	63,6
Married	46	35,6
Divorced and not married again	1	0,8
TOTAL	129	100

TABLE 2.37 OCCUPATIONS AND QUALIFICATIONS OF THE SPOUSES OF MEDALLISTS

Occupation of spouse	Qualification of spouse													
	N	B.A.	B.A. (Hons)	M.A.	B.Sc.	B.Sc. (Hons)	M.Sc.	D.Sc.	D.Eng.	M.B. Ch.	B.Sc. Med.	B. Com.	M.B.A.	B.Ed.
No information														
Not married	83													
Professional and semiprofessional workers														
Librarian			1											
Lecturer			1											
Physiotherapist					1						1			
Physician										1				
Engineer: Electrical									1					
Teacher		1			1									
Computer programmer														
Psychologist				1										
Chemist								1						
Speech therapist		2												
Language adviser		1		1										
Nurse														
Administrative workers: Personnel manager		1												
Clerical workers: Secretary/typist														
Skilled artisans; Medical laboratory technician														
Housewives		2			2	1	1					1		
Full-time students					1								1	1
TOTAL		7	2	2	5	1	1	1	1	1	1	1	1	1
Percentage		16,7	4,8	4,8	11,9	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,4

(continued)

TABLE 2.37 (continued)

Occupation of spouse	Qualification of spouse								
	Dipl. Nursing	Dipl. Domestic Science	Dipl. Med. Technology	Dipl. Secretarial	Dipl. Design	Dipl. Teaching	Cert. Std 8	Total	%
No information								39	
Not married								83	
Professional and semiprofessional workers								24	57,1
Librarian								1	2,4
Lecturer								1	2,4
Physiotherapist								2	4,8
Physician								1	2,4
Engineer: Electrical								1	2,4
Teacher		1				5		8	19,1
Computer programmer	1							1	2,4
Psychologist								1	2,4
Chemist								1	2,4
Speech therapist								2	4,8
Language adviser								2	4,8
Nurse	3							3	7,1
Administrative workers:								1	2,4
Personnel manager								1	2,4
Clerical workers:								1	2,4
Secretary/typist				1				1	2,4
Skilled artisans:								1	2,4
Medical laboratory technician			1					1	2,4
Housewives				1	1	2	1	12	28,6
Full-time students								3	7,1
TOTAL	4	1	1	2	1	7	1	42	100,3
Percentage	9,5	2,4	2,4	4,8	2,4	16,7	2,4	100,4	

(57,1 %) of them practised professional or semiprofessional occupations; 12 (28,6 %) were housewives; one (2,4 %) each was employed in an occupation of an administrative nature, a clerical nature and in a skilled artisan's trade; while three (7,1 %) were full-time students.

It is also striking to note that almost half of the spouses' occupational activities were concentrated in two occupations only, namely housewife and teaching. Table 2.37 shows that 28,6 % of the spouses are presently working as housewives, and have qualifications that vary from a Std 8 certificate to a M.Sc. degree. The second largest group is composed of teachers (19,1 %) of whom six (5 + 1) obtained teaching diplomas, one obtained a B.A. degree and one a B.Sc. degree.

As far as qualifications are concerned, Table 2.37 also reveals that the spouses of the 42 medallists who supplied information on their husbands/wives obtained 16 Bachelor's degrees, 4 Honours degrees, 4 Master's degrees and one Doctor's degree in all. The degree obtained by the largest number of spouses (7) was a B.A. Only one of the seven is involved in teaching, two are speech therapists, one is a personnel manager, another one is a language adviser and two are housewives.

In Tables 2.38 and 2.39 the occupations and the qualifications of the spouses are grouped into categories in order to consider the matter from a somewhat different angle. According to Table 2.38 the three occupational groups best represented are the following: Housewife (28,6 %), educational (21,4 %) and medical (21,4 %). The other groups are represented less well and vary from 7,1 % and 2,4 %.

The qualifications given in Table 2.39 show that 25 % of the spouses obtained a university degree, 16 % a tertiary diploma and 2,4 % a pre-tertiary school certificate. Among the degree groups, "Arts" proved to be the most popular (11 out of 42, i.e. 26,2 %), followed by a qualification in the natural sciences (8 out of 42, i.e. 19 %).

TABLE 2.38 OCCUPATIONS OF THE SPOUSES OF MEDALLISTS

Occupations	Number	Total	Percentage
No information was received on occupation	40		
Not married	82		
1) Management sciences: Personnel officer	1	1	2,4
2) Physical sciences: Chemist	1	1	2,4
3) Housewife	12	12	28,6
4) Engineering: Electrical	1	1	2,4
5) Communication: Language adviser	2		
Librarian	1	3	7,1
6) Medical: Physician	1		
Nurse	3		
Speech therapist	2		
Physiotherapist	2		
Laboratory technician	1	9	21,4
7) Educational: Lecturer	1		
Teacher	8	9	21.4
8) Secretarial service	1	1	2.4
9) Social sciences: Psychologist	1	1	2,4
10) Arithmetical occupations: Computer programmer	1	1	2.4
11) Full-time students	3	3	7,1
TOTAL	164	42	100.0

TABLE 2.39 QUALIFICATIONS OF THE SPOUSES OF MEDALLISTS

Highest qualification	Number	Total	Percentage
No information was received	39		
Not married	83		
1) School certificates (Std 6 - 10)	1	1	2,4
2) Diplomas:		16	38,1
Domestic Science	1		
Medical	5		
Teaching	7		
Design	1		
Secretarial	2		
3) Degrees:		25	59,5
Commerce (B.Com., M.B.A.)	2		
Engineering (B.Eng.)	1		
Arts (B.A. - M.A.)	11		
Medical (B.Sc.(Med.), M.B.Ch.B.)	2		
Natural sciences (B.Sc. - D.Sc.)	8		
Education (B.Ed.)	1		
TOTAL	164	42	100

CHAPTER 3

EVALUATION AND RECOMMENDATIONS

3.1 EVALUATION

3.1.1 Introduction

The decisive question at this point, is whether maintaining this type of examination is meaningful. Judging by the experience of overseas countries it definitely seems to be so. From the subject literature (cf. Malan, 1971 : 7) it appears that such olympiads succeed in discovering the potential of pupils at a relatively early and critical stage. Some of the medallists abroad openly declared that it was a revelation to them to experience the decisive effect that the Mathematics Olympiad had on their study plans (Malan, 1971 : 7). In this regard one may indeed speculate whether the fact that the Mathematics Olympiad originated in Hungary has contributed to the exceptionally large number of outstanding mathematicians this small country has produced. Because cause and effect are so reciprocal in a case like this, it is impossible to reach a scientifically valid conclusion. However one fact that is indisputable is that many countries followed the Hungarian example and introduced similar mathematics olympiads at home (Malan, 1971 : 6).

In evaluating the South African Mathematics Olympiad, consideration should be given to the question whether the aims/objectives of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns with the Mathematics Olympiad have in fact been achieved. These aims, as explained in Paragraphs 1.4 and 1.6 are briefly repeated here for the sake of clarity:

(1) To discover youthful talent in time and encourage its development;

(2) to satisfy the highly gifted pupil's need for special exercises in mathematics;

(3) to draw the attention of the highly gifted child to the possibility of following a career as a mathematician.

(4) to force pupils to think intensively, to think a lot and to write little;

(5) to stimulate mathematics teaching in general with a view to raising the level of such teaching, and

(6) to encourage the pupils to enrich their knowledge through work done outside the classroom situation and to broaden and deepen their insight into the basic mathematical concepts.

In attempting to establish whether the above aims have indeed been achieved, it should be borne in mind that no sensational deductions can of course be inferred from the statistical data in Chapter 2; it is, however, possible to draw a number of meaningful conclusions.

3.1.2 The significance of the Mathematics Olympiad

(1) When considering whether youthful talent is discovered in time and encouraged to develop, it should first of all be remembered that the term "youthful" is a broad concept and may refer to various development stages of a child - the Suid-Afrikaanse Akademie vir Wetenskap en Kuns did not formulate this aim explicitly. For the purpose of this report we content ourselves with three possible periods within the "youthful" age category:

(a) The senior secondary school phase (Std 8 - 10): This is the target group of the Mathematics Olympiad. Numerous medallists expressed their gratitude for an event such as the Mathematics Olympiad as, in their opinion, it exercised a decisive influence on their study plans. This testimony is a clear indication that youthful talent is indeed discovered and encouraged in this way.

(b) The junior secondary school phase (Std 5 - 7): Recently two special mathematics exercises were introduced for pupils in this phase of their school career:

(i) A mini-Mathematics Olympiad for Std 6, 7 and 8 pupils that was introduced by a petroleum company for schools in the PWV area (Pretoria, Witwatersrand, Vereeniging) in 1980. Entries for the first round were received from approximately 80 000 pupils, of whom 1 500 were allowed to the second and final round. These 1 500 pupils represented about 270 schools. Each of the 1 500 pupils received a certificate while the top achievers in each standard group were awarded a special certificate. The school that performed best was also given special recognition.

(ii) A Mathematics Olympiad was also arranged for Std 5 pupils. In 1981 the Northern Transvaal branch of the Mathematical Association of South Africa arranged a Mathematics Olympiad for schools in that region. After 1982 this olympiad was extended to all schools in the Transvaal. It consists of one round in which up to 4 000 pupils (as was the case in 1984) take part. The top twenty-five pupils each receive a gold medal, and additional acknowledgements are made to the participants whose performance exceed a required standard: the first 10 % of the pupils (arranged according to their achievement) each receive a gold certificate, the next 10 % a silver certificate each and the next 20 % a certificate of merit each. The top achiever in every school also receives a certificate. In this olympiad the emphasis therefore seems to be on participation.

It is still too early to determine the effect of these two olympiads on the achievement of pupils, but everything indicates that these special mathematics exercises will definitely contribute to the timeous identification of youthful talent and the development of such talent.

(c) The senior primary school phase: Special attention has so far not been given to youthful talent in this school phase, but more will be said about this matter in the recommendations (Paragraph 3.2).

(2) The second question is whether the highly gifted pupil's need for special exercises in mathematics is satisfied.

It seems from Chapter 2 that the favourable home and school background of the medallists in general contributed to the creation of a milieu in which they were able to perform well academically. The fact that (i) most of the parents obtained average to above average qualifications and practised middle-level to high-level occupations (of which a large number were strongly mathematically oriented), (ii) the fact that most medallists enjoyed a well-balanced school education with adequate sport and cultural activities, and (iii) the fact that the hobbies pursue(d) by most of the medallists are/were generally of a stimulating nature, all point to a positive academic milieu.

Chapter 2 also reveals that the medallists are found at the upper end of the talent distribution curve. The large number of Std 10 subject distinctions is adequate proof of this. The Mathematics Olympiad indeed offers an interesting and challenging opportunity to such pupils.

This is precisely the tremendous value of the Mathematics Olympiad: the gifted pupils are confronted by a unique challenge which may serve to rouse an interest that has perhaps been dormant.

(3) The third question centres on whether the Mathematics Olympiad stimulates the highly gifted child to follow a career as a mathematician, or merely to pursue a mathematical field of study. Judging by the data in Chapter 2, the Mathematics Olympiad apparently achieved this aim to a large extent. From Paragraph 2.4 (Table 2.24) it is clear that as far as tertiary training of the medallists is concerned, 72,3 % of those from whom information was received had obtained a degree in engineering or a natural sciences field of study, and that 60 % were at the time of the survey engaged in a study of either of these. A study of the occupations of the medallists, Table 2.34 (Paragraph 2.6) shows that 55 of the 118 medallists from whom this information was received were full-time students and the remaining 63 were working full time. Of this group of 63 there were 19 (i.e. 30 %) who worked as engineers and 16 (i.e. 25 %) who practised some or other arithmetical occupation.

With the information that the researcher has available, it is not really possible to determine whether the gifted pupil would have followed a mathematical field of study, regardless of whether he had taken part in a Mathematics Olympiad or not. The only suggestion that the Mathematics Olympiad indeed had a decisive influence on the medallists' fields of study is the spontaneous testimony of some medallists to this effect.

Following this discussion, Malan (1971 : 7) enquires after the predictive value of achievements in the Mathematics Olympiad with regard to future progress at tertiary level.

According to Paragraph 2.4 it is evident that most medallists (99,2 %) had either already obtained one or more university qualifications, or were still engaged in study at a university at the time of the survey. This state of affairs in itself contains predictive value. The additional fact that approximately 18 % of the medallists obtained their university degrees *cum laude* may also be regarded as confirmation of a relatively high correlation between the medallists' achievement in the Mathematics Olympiad and their success at university.

The graduation ceremony programmes of seven of the eleven universities in the RSA revealed that on the average 8,4 % of the students in the natural sciences (B.Sc., B.Sc. (Hons) and M.Sc.) passed their final year's examination with distinction in 1981 and 1982. This figure is 6,9 % in the case of the students of engineering (B. Eng., B.Eng. (Hons) and M.Eng.). As most medallists study/studied in either of these fields, a meaningful comparison can be drawn between the 18 % mentioned above and the 8,4 %, as well as the 6,9 %.

The predictive value therefore lies in the fact that most medallists do in fact register for university training, achieve above average results in such studies and approximately 70 % of them follow a course of study in which mathematics plays an important role. (See Tables 2.15 and 2.16 under the heading "Already obtained".)

(4) Another question to be considered is whether pupils are really forced to think intensively, think a lot, and write little. Paragraph 1.3 indicates clearly that this is actually the case. The papers for the Mathematics Olympiad are deliberately set in such a way that there is ample time for reflecting on the problems - if a candidate were immediately able to do all the questions, it would probably not take more than one hour to complete the three-hour paper.

(5) Next the problem concerning the quality of mathematics teaching must be examined. It has to be determined whether the Mathematics Olympiad has made any significant contribution to improving the quality of such teaching. This question cannot be satisfactorily resolved on the basis of the information available, and consequently we have to content ourselves with the following thought: The inception of the Mathematics Olympiad opened up a new world to the highly gifted teacher and child - a challenge that would in many cases contribute to enriching mathematics teaching in the classroom and in this way serve to raise the quality of teaching in those teachers' classes. The extent to which this in fact happened, however, cannot be established here.

Malan (1971 : 7) also raised other questions concerning the teaching of mathematics, but at present we can merely speculate about these without obtaining satisfactory answers. The questions are:

(a) Why do some schools perform better than others? Has it anything to do with the fact that these schools offer Additional Mathematics and/or Computer Study and/or Applied Mathematics as school subjects? Is it possible that more attention is paid in the lower standards to drilling and problem solving exercises?

(b) Why have so few Afrikaans-speaking pupils won medals (17,7 %) compared to the larger number of English-speaking pupils (73,2 %)? Is the answer to this question perhaps the fact that the English-speaking parent communicates with his child on an academic level more easily than his Afrikaans counterpart? Does the English-speaking parent more readily buy certain development games and/or electronic equipment for his child than does the Afrikaans-speaking parent? Is the Afrikaans-

speaking child perhaps not adequately encouraged to take part in the Mathematics Olympiad? (See Paragraph 2.2.1 where this matter was discussed.)

(c) Why are pupils in general not capable of solving even uncomplicated problems unless they can be done according to a mechanical and stereotyped pattern? It seems as if the matter at hand is concerned with "teaching with insight" and "learning with insight", and with the relationship between the two as well as the ability to do both. This problem appears to be a cause of concern all over the world. At the Fourth International Congress on Mathematics Education (I.C.M.E.) that was held in 1980 and where the TED was represented by *inter alia* Mr H.J. Ahlers, this problem was also discussed at length (Transvaal Education Department, 1980 : 1). Certain recommendations were made, but these have still to be tested in practice. However, one thing is true: the final word has not yet been said about this vexing and very important problem.

(6) Finally some attention must also be given to the question of whether the Mathematics Olympiad has succeeded in encouraging pupils to enrich their knowledge through work outside the classroom situation, and to broaden and deepen their insight into the basic mathematical concepts. This question also cannot be answered with the data obtained. All that can be repeated here is that the highly gifted child has a need for special mathematical exercises that are not necessarily confined to the classroom or the syllabus, and that the Mathematics Olympiad will most probably stimulate such pupils to enrich their existing knowledge through work outside the classroom situation. However, this cannot be proved conclusively.

To conclude, it can therefore be deduced that what the Suid-Afrikaanse Akademie vir Wetenskap en Kuns envisaged with the inception of the Mathematics Olympiad has to a large extent been achieved.

3.2 RECOMMENDATIONS

(a) The Mathematics Olympiad for senior pupils has already become an established event, but in recent years a need for a similar Mathematics Olympiad for the senior primary and junior secondary phase (i.e. Standards 2, 3, 4 and Standards 5, 6,7) has also come to the fore. Such an olympiad would offer a challenge to the highly gifted pupil in those age groups and in some overseas countries it is already an annual event with the examination papers concentrating on testing the pupil's ability to think logically (Van Rooy, 1973 : 4-15). It is therefore encouraging to note that a petroleum company now arranges a mini-Mathematics Olympiad for Std 6, 7 and 8 pupils in the PWV area, while the Mathematics Association of South Africa, arranges an olympiad for Std 5 pupils in the Transvaal. An attempt should be made to extend these two olympiads to the rest of the schools in the RSA. Consideration should also be given to the inception of an olympiad for senior pupils in the primary school, as it would fill a serious gap in the development of the gifted child's ability to think logically.

(b) A question also raised is whether consideration should be given to rewards other than personal satisfaction for the medallists of the Mathematics Olympiad. In Hungary, for example, the ten pupils who perform best in the Mathematics Olympiad need not write an entrance examination for a university or other institution for tertiary education (Van Rooy, 1973 : 12). However, it remains an open question whether such a special privilege or other privileges should be considered as incentives for medallists in the RSA. Malan (1969 : 136) (translated) points out the intrinsic value of a medal and remarks: "The achievement of winning a medal in the Mathematics Olympiad, or even qualifying for the second round, will increasingly be of great value to the candidate concerned. Firstly it is a great honour to achieve this distinction and secondly institutions will more and more be prepared to make offers in the form of bursaries, etc. to such pupils. For this reason every pupil who has a chance to achieve this distinction must be entered by the school concerned, otherwise the pupil is done an unforgivable injustice." No restrictions can of course be placed on the offers and other privileges that are made available to the medallist as the result of his acnievement

in the Mathematics Olympiad - any institution has the right to make such offers and it is the medallist's privilege to receive them - but it is doubted whether the introduction of a specific reward scheme will in the long run be to the advantage of the Mathematics Olympiad, and that of the pupil in particular. An arrangement like this may even undermine the original aim of the Mathematics Olympiad; a pupil should not be lured by the external reward, but his prime consideration should be the inner challenge and satisfaction offered by the Mathematics Olympiad.

(c) The institution of mathematics clubs should be considered: Paragraph 2.3.4 showed that a very small number of the medallists (5,6 %) were members of such clubs, for the mere reason that in most cases none existed. Gifted pupils in the senior classes of the primary school should already be encouraged to join a school mathematics club. A secondary school can for example have two clubs, one for juniors and another for the senior pupils, and should not have more than 15 members. Where mathematics clubs still have to be founded, or where difficulty is experienced with the way in which they are run, advice can be obtained from some overseas countries that have extensive literature available on the planning, organisation and management of mathematics clubs (HSRC, 1971b : 19, 20).

Mathematics clubs have a number of advantages, of which the most important is assembling an active group of pupils as mathematics enthusiasts with the opportunity of developing their natural talents and logical thinking ability in the company of friends. For example, in Russia a booklet containing preparatory problems is mailed early every year to prospective candidates for the Mathematics Olympiad examination. These problems are then worked out with great enthusiasm in the different mathematics clubs and mathematics study groups, so that the actual Mathematics Olympiad forms the highlight of a year's intensive work (HSRC, 1971 b : 2).

3.3 CONCLUDING REMARK

The main aim of this investigation was to form a picture of the medallists of the South African Mathematics Olympiad as a group of

mathematically highly gifted pupils. The picture is largely based on information that was obtained regarding the home background, scholastic training and tertiary training of the medallists and it appeared that achievement in the Mathematics Olympiad (1) had not been an isolated event, but rather confirmation of the pupils' special interest and ability in mathematics, and (2) that it apparently served to encourage them to consider further study in a mathematical field of study. The authors sincerely hope that interested persons will find this report useful.

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Teleks 3-0893

NIPN

Posbus 32410, Braamfontein 2017
Republiek van Suid-Afrika
Telegramme NAVORSPERS
Tel. (011) 339-4451
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Wes-Kaap, Privaatsak X40, Parow 7500
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